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THE AMERICAN

GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME XXXI.—No. 8.
Whole No. 488.

NEW YORK, THURSDAY, OCTOBER 16, 1879.

$3 PER ANNUM
IN ADVANCE.

A. M. CALLENDER & CO., Proprietors.
G. WARREN DRESSER, C.E., Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European Countries, $3 50 (15 shillings—18 francs). All payments to be made in advance. Single copies, 15 cents.

Remittances should be made either by post-office order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

The American News Company, Nos. 39 and 41 Chambers Street, New York, are agents for this Journal. Newsdealers will send orders to them.

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[OFFICIAL NOTICE.]

OFFICE AMERICAN GAS-LIGHT ASSOCIATION,
117 BROADWAY, N. Y. CITY, Sept. 15, 1879.

To the Members of the Association:

The Seventh Annual Meeting of the Association will be held at Philadelphia, Pa., on the 15th, 16th, and 17th of October. Headquarters at the Girard House, Ninth and Chestnut streets. Meetings to be held in Franklin Institute Hall.

All members who intend to present papers to the meeting are requested to inform the Secretary by letter at once.

Each member expecting to attend the meeting will confer a favor upon the local committee of arrangements, by notifying the undersigned of such intention at the earliest possible day.

CHARLES NETTLETON, *Secretary.*

THE GAS WAR IN NEW YORK.

During the past two weeks there has been nothing new in the way o prices for gas. Each company maintains the same rates as those given one month ago. Several meetings are said to have been held by the representatives of the different companies, for the purpose of coming to some understanding as to future prices; but "many men of many minds" seems to have been the practical result, and, as yet, no definite action appears to have been taken. One difficulty, no doubt, is found in coming to an agreement as to cost price where there are so many different processes in use. Each process is "perfect," and by "far cheaper than any other"; but, nevertheless, it seems to be a general opinion, common to all, that the present prices are too low.

Those making pure coal gas find the margin of profit very small. Those using anthracite and naphtha are reminded by the prices of those materials in the market that a large increase of cost may be entailed upon them by the proposed rise in anthracite coal and oil. These are items that count largely where it takes about 100 lbs. of coal, and five or six gallons of naphtha, for every thousand feet of gas sold. Unquestionably, the prices that have ruled for the past summer have been greatly to the advantage of this method of gas making, so far as cost of material is concerned.

In Brooklyn things continue to be in a most beautifully "mixed" condition. The "Mutual" Company was supposed to have died, and its remains to have been quietly and decently buried by the young and vigorous Fulton Municipal Company, who bought out its rights and franchises and commenced digging up the streets. Courts were invoked. Injunctions were flying about promiscuously. All at once the Mutual came to life again (*in Court*) and asked to have a receiver appointed. This done, injunctions were again resorted to, until it would puzzle a Philadelphia lawyer to explain the exact legal status of the dual opposition; meanwhile, pipes were being laid in a vigorous manner, and vigorous projects are said to be talked of for quieting the row.

Consolidation, amalgamation, etc., without the new company, and with it, cutting down capital to "hard pan" basis, and increasing stock, so as to enable everybody to get out whole—these are only a few of the rumors that are flying about. What the result, if any, may be we shall try and give our readers when it is reached.

There is one thing that plain common sense would seem to suggest, and that would be to put aside all scheming and financiering, quietly determine the actual value of plant on hand, and form one company, with the smallest possible capital, and then, for once, give Brooklyn a rest from controversy, by selling good gas cheap.

WATER-GAS: ITS HISTORY AND MANUFACTURE.

In the *Sanitary Engineer* for October first there is given the first of a series of articles upon this subject, from the pen of Prof. Henry Morton, Ph.D., which certainly will well repay the reader for the most careful study. It is treated from a scientific standpoint, and begins with a definition of the term water-gas, and explains the more special meaning that is attached to the term when used in connection with the subject of illuminating gas at the present time. The elementary chemical principles involved in the manufacture of this water-gas are enunciated as follows:

"In the first place, as to the elementary chemical principles involved.

"When steam is brought into contact with ignited carbon, in the form of charcoal, anthracite, or the like, the steam (which consists of two volumes of hydrogen gas united with one volume of oxygen, and so condensed by the union as to form two in place of three volumes) is decomposed. Its oxygen combines with the carbon to form carbonic oxide (CO), or carbonic acid (CO_2), or a mixture of the two, in proportion depending upon the relative quantities of steam and carbon, which can act on each other, the temperature, and other conditions. If great excess of ignited carbon be present, the product will consist mainly of hydrogen and carbonic oxide; if the steam is in excess, and the temperature high, steam and carbonic acid will be the chief products.

"Intermediate results might be expected in most practical operations, and, moreover, impurities in the material used, such as sulphur and iron in the coal, air accidentally or of necessity introduced, corrosion, or rather oxidation of iron retorts, may be expected to modify the results, even on theoretic grounds.

"Such variations are indeed observed in practice, and are of a very marked character."

The *theoretical* results to be obtained by the decomposition of water by means of incandescent carbon are stated to be as follows. This, of course, refers to the "water-gas" independently of the illuminating agent which is subsequently introduced in the form of oil or naphtha, to convert these products of decomposition into illuminating gas.

"Theoretically, 15·8 lbs. of pure carbon and 23·5 pounds of water would make 1,000 cubic feet of gas, half hydrogen and half carbonic oxide; or 10·5 pounds of carbon and 31 pounds of water would make 1,000 cubic feet of a mixture, in which two-thirds, by volume, was hydrogen and one-third carbonic acid. Where a mixture of hydrogen, carbonic acid, and carbonic oxide was produced, the theoretical proportions of the materials would be intermediate between these extremes. Thus, such a mixture as that obtained by Howitz would require 12·7 pounds of carbon and 2·85 pounds of water for each 1,000 cubic feet of gas produced."

The water-gas, as made by various "processes" to-day, has never been able to reach this theoretical result by any means. We often hear very large statements as to the amount of gas obtained from a ton of anthracite coal in this way, but it is always well to remember that the theoretical limit is never reached, and, moreover, it must be distinctly borne in mind that the coal put into the "generators," or "cupolas," or "gasogens," does not constitute all the fuel involved in the problem. It is easy to say that "all that is required is to introduce steam, etc.," but that steam must first be made from water, and the fuel used here is as much a part of the cost of gas making as that in the cupola. Dr. Morton refers to this point as follows:

"It must not be forgotten, however, that, in the first place, coal is not pure carbon, and, in the second, that the coal involved in the chemical reaction above noticed is but a small part of what is required to produce the result, the main expenditure being in fuel to develop and maintain the temperature, and supply the heat-energy by which these reactions are brought about.

"The most reliable statements on this subject seem to show that about 100 to 150 pounds of coal are actually used in the production of each thousand cubic feet of water-gas by the various processes heretofore developed."

Referring to the heating effects of the water gas, the Doctor observes as follows:

"The heating effects of the two gases, hydrogen and carbonic oxide, are as follows:

"One pound of hydrogen, in burning, will develop heat enough to raise 62,032 pounds of water 1°F.

"One pound of carbonic oxide, in burning, will develop heat enough to raise 4,478 pounds of water 1°F.

"Evidently, a mixture of hydrogen and carbonic oxide would constitute a very efficient fuel. What its economy would be, as compared with the coal employed in producing it, is, however, another matter. The exact relations of this we do not propose here to discuss, but would call attention to the following elementary principle:

"The doctrine of 'conservation of energy' teaches us that a cycle of changes, ending where it began cannot render any energy available, but must leave things where it found them in this respect, except in so far as loss by the scattering of energy into surrounding bodies may have occurred.

"Thus, if we decompose water by means of ignited coal, there will be just as much heat withdrawn from the apparatus by that act of decomposition, as the liberated combustibles can produce by again burning. Great loss may and will occur by the transfer of heat to surrounding objects and into space, and thus the combustible gases produced can have only a fraction of the total heating capacity originally residing in the coal.

"Their convenience of application may, and in certain cases does, give them a great economic value, but this we must, of course, credit to its true source. This is, perhaps, quite a superflous statement to most of my readers; but, for the sake of leaving no chance of a misunderstanding, I have ventured to make it."

In other words, we understand from this, that the heat to be obtained from the gas made from a pound of coal is only equal to a fractional part of the heating effect of the coal itsel; or, more plainly, a part cannot be equal to the whole.

Hastings's Gas and Water Companies Directory.

We have received the third issue of the above. It gives a complete list of all the gas and water companies of Great Britain, together with the amount of capital, the population of the towns where located, and the names of the manager, chairman, and secretary. Added to this is given the statistics of many of the companies as to tons of coal carbonized, amount of gas made, price to public and private consumers, and the dividends paid.

Under the system of published accounts, which is in vogue in England, this is possible, but it could hardly be accomplished in this country.

The book makes a handsome contribution to English gas literature.

Growth and Magnitude of the Petroleum Business.

The production of crude petroleum in the Pennsylvania Oil Fields for the first eight months of 1879 was 12,386,497 bbls., against 9,810,327 bbls. for the same time in 1878, making an increase of 2,576,170 bbls., which is equal to about 26 per cent.

The amount shipped out of the producing regions in crude and refined reduced to crude equivalent for the first eight months of 1879, was 9,612,851 bbls., against 8,220,291 bbls. for the same time in 1878, making an increase of 1,392,291 bbls., which is equal to about 17 per cent.

The amount of crude held in stock in the producing regions on the 31st of August, 1879, was 7,390,945 bbls., against 4,717,877 bbls. at the same time in 1878, making an increase in stock of 2,673,068 bbls., which is equal to about 36 per cent.

The exports of petroleum and its products from the United States for the first eight months of 1879 were 236,737,105 gallons against 190,847,629 gallons for the same time in 1878, making an increase of 45,889,476 gallons which is equal to about 24 per cent.

The number of wells producing in the Pennsylvania Oil Fields on the 31st of August, 1879, was 11,585, against 9,884 for the same time in 1878, making an increase of 1,701, which is equal to about 11 per cent.

The number of wells drilling in the producing regions on the 31st of August, 1879, was 258, against 185 for the same time in 1878, making an increase of 73, which is equal to about 40 per cent.

To this wonderful growth the Great Northern or Bradford district has been the chief contributor during the eight months of this year by adding—

To production, 8,298,761 barrels, which is about fifty per cent. of the whole.

To shipments, 5,189,531 barrels, which is about fifty-four per cent. of the whole.

To stock, 4,809,793 barrels, which is abont fifty-four per cent. of the whole.

To number of producing wells, 1650, which is about 132* per cent.

To number of drilling wells, 201, which is about seventy-eight per cent. of the whole.

—*Stowell's Petroleum Reporter.*

Canadian Oil.

The price of refined has been elevated by the action of the Syndicate to 9 cents per gallon. It has had no visible effect as yet on the crude market, the price remaining firm at 65 cents, with no apparent indications of an advance before next month. So soon as some of the large holders get within their greedy grasp all the stock they can carry, then we may look for an advance in the price of crude, but not before. The few large strikes that have been made in the Pithole district lately have had no effect on the market, save in the minds of fearsome holders of stock. At no time within the past five years has the production been so low as at the present time. Very few transfers of crude have been made since our last report.

The following are the sales recorded on the bulletin board of the Tanking Company since our last.—August 29th, 200 bbls., ground tanks on railroad track, 64 cents; September 1st, 200 bbls., ground tanks on railroad track, 64 cents.

The following are the shipments of oil from this town (Petrolea), for the month of Aug.: Per G. W. Ry.—Crude, 20,488 bbls.; distillate, 910 bbls.; refined, 2,960 bbls. Per C. S. Ry.—Crude, 1,698 bbls.; distillate, 1,056 bbls.; refined, 242 bbls.—*Ibid.*

* Other districts abandoned 402 wells.

[From the "Journal of Artificial Light."]

Half-Yearly Meeting of the West of Scotland Association of Gas Managers.

The fifteenth half-yearly meeting of the West of Scotland Association of Gas Managers was held at Bridge of Allan on Thursday, Sept. 18, Mr. Robert Mitchell, gas manager, Coatbridge, President of the Association, occupied the chair.

ADMISSION OF NEW MEMBERS.

Messrs. Watson (Callander), W. Hamilton (Kilsyth), were admitted as ordinary members; and Mr. Galloway, tar distiller (Pollockshaws), and Mr. John Rennie, tube manufacturer (Glasgow), were admitted as extraordinary members of the Association.

PRESIDENT'S INAUGURAL ADDRESS.

The President said: Before beginning the business of the meeting, you will allow me to express my most cordial thanks for the honor you have conferred upon me in electing me to the presidency of this Association, which I am happy to say occupies a most influential position among the institutions of our profession. In taking the chair this morning I have considerable diffidence, but with your indulgence and generous aid I venture to hope that this meeting may prove as interesting and profitable as any of our former gatherings. As the main object of our Association is to mutually improve each other, and to advance the science of our profession, I trust the same vigorous interest will be manifested and the friendly interchange of opinion reciprocated as on former occasions.

Nothing is more gratifying to the members of any association than its continued success, and no better indication of the prosperity of our Association can be given than the continued and uninterrupted increase of its membership. This, I think, indicates that the benefits accruing from the interchange of opinion and the careful consideration of the various subjects brought forward for discussion have, to a great extent, been appreciated by members of our profession.

During the half year there have been no claims on the benevolent fund by members of the society, but I am sure you will be pleased to know that we have been able to render a little assistance to the widow and family of a gentleman whose name will ever be connected with gas purification and the revivification of oxide of iron. I consider this fund one of the most pleasing features of our Association. Nothing is more calculated to excite feelings of pleasure than the assurance that one has been able to alleviate the distress of his fellow—distress, it may be, brought on by protracted illness or by circumstances over which the sufferer has no control.

I have remarked that our Association is intended for our improvement. As a means toward this end, free and open expression of opinion must exist. Freedom of thought is enjoyed by all, but this freedom is ineffective unless accompanied by freedom of speech, and unless freedom of action be the outcome of both. Thought, undoubtedly, is the grand central motive power of society, and out of which all progress springs. The amount of progress will be in proportion to the facilities afforded for its growth and culture. How much has been accomplished by the advancement and development of science in our day! Great engineering undertakings have been carried through which could not have been conceived but for the progress of thought. The achievements of others, then, ought to stimulate us and encourage us to apply ourselve with all vigor to whatever comes before us. In our own as in all other associations, "many men, many minds," and consequently opinions differ. The expression of opinion ought always to be made with clearness, gentleness, and moderation, and should an opinion expressed not be in accordance with the views of other members, the same ought to be made known in a friendly and frank manner, bearing in mind that the true principle of discussion on any subject ought to be that a clearer conception may be entertained, and the liability to error lessened, and to have the satisfaction of knowing that we have gained valuable information and have formed clearer views of the subject under consideration. Men preserve and overcome most when their own active energies are in active operation for the promotion and furtherance of their own heart's wishes. There can be no satisfaction in acquiescent passivness. It cannot be compared with the benefits arising from self-application and persevering persistency—not in the seeking of our own individnal gratification, when opportunity serves, because that is too contracted to comprehend wide consequences, and makes men slaves to feeling instead of being independent and free.

While touching upon this topic, perhaps you will permit me to remark that the gas managers of Scotland have long desiderated the establishment of a journal in their midst which would fully and fairly represent their opinions, and which would, at the same time, be a suitable medium for the interchange of views on special topics as they cropped up. By the establishment of the *Journal of Artificial Light* we have been during the past year favored with such a medium, and as the *Journal* is about to enter on the second year of its existence, and as it exhibits a wonderful amount of vigor for its age, I trust that all gas managers will see it to be their duty and interest to give the *Journal* that amount of support which it deserves.

Casting a retrospective glance over the occurrences of the bygone six months, I am glad to be able to say that the world, from a gas point of view, has considerably improved. The hue and cry that electricity was about to supplant gas has subsided, and gas is still being manufactured, sold, and used. I would not for a moment have it supposed that gas managers, Othello-like, ever dreamed that their occupation was gone, or ever entertained the remotest idea that electricity was to occupy the proud position of ousting gas from the circle of illuminants; but others, less familiar with the minutiæ of these matters, were unfortunately trapped into parting with their script, and only when too late have they realized the hollowness of the claim for electricity that it could be produced at less cost than gas. Standing, as we do, on the very threshold of electrical science, it behoves us to make ourselves as familiar as possible with the purposes to which this subtle element can be applied, not because their is any present danger of it entering the domain of gas, but in order that every manager in Scotland may be in the position of giving an intelligent reason to his directors why electric wires can never supplant gas mains, or carbon points gas burners. It would be idle for me to take up your time further with this subject at present. The greatest minds of the age are applying themseles to solve the mystery of what may be regarded as one of nature's enigmas; and while we may be able to form practical opinions, based upon the result of their researches, we can meanwhile only stand by while the work of investigation proceeds. While I make this passing allusion to the problem of electric lighting, it is right that I should also mention, in a word, that great advances have been made in the way of lighting by gas. Occupying the position I do to-day, it would perhaps be invidious on my part to make mention of any particular invention; but at the same time it is perfectly plain to everyone that the cry for more light has been amply satisfied by gas engineers, both in Scotland and England.

But leaving the past and coming to the present, you will observe from the programme of business that a most important subject is to be brought up for discussion—viz., the amalgamation of the North British Association of Gas Managers with the West of Scotland. On this I shall say but little, as I have no wish to anticipate the remarks of any gentleman, or the finding of the meeting. I will simply refer to one of the advantages which might reasonably be expected from having a central association. It is not a question as to which association is to be looked upon as the most successful, but the establishment of an association in Scotland, which will occupy the position of having all the district associations as subordinates. By this means there would be a higher platform for the submission of papers on subjects which the district association might consider advisable to have a wider range of intellect brought to bear upon them. This, I say, is one of the advantages of having a central association. But as to the amalgamation of the two associations, you shall have an opportunity of considering what steps ought to be taken in the matter.

A few months ago there was brought before the public a process by Mr. A. Miller, Glasgow—viz., improvements in the manufacture of illuminating gas and the utilization of the impure products resulting therefrom. The idea of the patentee is, taking his specification as my guide, to use nothing but common coal dross or tripping, and procuring therefrom a gas of 28-candle power. He proposes to allow the first part of the charge to escape into a separate main where it can be used for firing or heating purposes. The intermediate portion of the distillation is allowed to pass into the holder for the supplying of the consumer, and what is called the sedimentary part of the distillation is cut off and allowed to pass into the first-mentioned mains. He says that 8,000 cubic feet of 28-candle gas can thus be obtained. Whether or not in practical working his most sanguine expectations have been realized I have no information, but anyone who is at all acquainted with the distillation of coal for gas manufacture, I think, will have considerable difficulty in observing the practical utility of this invention.

While on this topic—the improvement of gases in their production—I have no doubt that many members will be gratified with the announcement in the *Journal of Artificial Light*, from Mr. Alexander Bell, Gibraltar Gas Works, as to the satisfactory results obtained by him in using the Aitken and Young Analyzer. I need not refer further to it, but, coming as it does from a gentleman of Mr. Bell's standing and experience, it augurs well for its success. The principal advantages are not only the high quality of the gas obtained without the use of cannel coal, but the entire absence of that troublesome naphthaline deposit which our southern brethren are so much annoyed with.

The many and varied applications of gas for illuminating, heating, and cooking purposes, are well worthy of our individual study and close attention. Gas in its original sphere—that of an illuminator—has outstripped

the most sanguine expectations. Who can look upon the magnificent Sugg burner, while it fills the large area with a subdued and soft light, without feeling that with applied skill gas cannot be excelled—shall I not say even equalled—as a means of illumination. Its application is ad libitum. There is no such thing as exhaustion of the subject, neither in the means of production, regulation, and general distribution and consumption. Any one who has visited an exhibition of gas apparatus, such as was held at Greenock, cannot fail to see the great field of a bright future for gas companies, and every manager ought to adopt every means in his power for the spread of information, and try to give the public an opportunity of becoming acquainted with the advantages of employing gas as a means of heating and cooking. It is, beyond doubt, superior to coal or any other fuel as a means of cooking, in regularity, cleanliness, and convenience, and cheapness. I need not make any allusion to the various modes of its application in stoves—the number is great, and the designs are various—each maker striving to give the maximum return for the quantity of gas consumed.

Gas as a motive power has been turned to good purpose in the Otto, the Eclipse, the Cropper, and the Bisschop's engines. This latter engine was to be seen working at Greenock. Its construction is simple; the working parts could be easily repaired if need be; its action is perfect, and the cost, I trust, will become even more moderate. It is the intention of the patentee to have these reduced in size, so that they will become a piece of general furnishings, and serve as an accompaniment to the sewing and washing machine.

The benefits arising from the proper control of pressure from holder to consumer is a subject deserving the most careful consideration. Governors of various designs and on different principles have been before us more prominently of late. The advantages of these on home consumption are very great, and ought to form one of the manager's points in the education of the consumers. By the adoption and supervision of the burners by the inspector, I am convinced that a more friendly feeling would exist between the consumers and companies generally. Were a consumer to see that an interest is taken in his procuring the greatest amount of light for a given sum, then hard sayings and indifferent expressions will cease, and the manager shall not be looked upon as the person who is exacting what is not due him.

While referring to the distribution, one point of importance is to have the architect, as well as the plumbers, to understand what size of pipe is necessary for the proper supply of tenements under their charge in erection. At one of our former meetings a suggestion was made that a tabulated form should be drawn up, with instructions for the proper carrying out of this most important part of the distribution. I think a manager who does not take an interest in seeing that the consumer is to have at his command a good and sufficient supply, is guilty of a direliction of duty in the first place, and throws himself open to a great amount of unnecessary trouble afterward. I trust that some of the members before our annual meeting will give some of the important points in the manufacture of gas their close and vigorous attention. May I suggest the subject of retort setting, the most advantageous internal size of arch, number of retorts in one setting, their size, and number of fires to each setting. As the subject of gas manufacture is wide, so is the experience of the members. I hope that at next meeting there will be a large number of interesting papers, as we must look upon it as everyone's duty to apply himself with all vigor to the advancement of our profession.

Mr. James C. Adamson (Airdrie)—I move our thanks to Mr. Mitchell for his very able and exhaustive address. I am sure we all feel that Mr. Mitchell has dealt fairly with the subjects he has brought before us. It is perhaps an open question—that of lighting by gas or electricity. There may be differences of opinion on that question which time alone can solve; but I am sure that what Mr. Mitchell has brought under review has been fraught with a considerable amount of interest to gas managers and others not immediately connected with the gas world.

[To be Continued.]

Cheapening Fire-Proof Buildings.

Experience has shown that supposed fire-proof floors, supported on brick arches springing from iron beams, fail to stand the intensity of a great conflagration, the beams warping and springing, the arches crumbling to pieces and allowing the floors to fall. In the building where corrugated iron ceilings are used, the arches remain almost uninjured by fire, and require little more than painting to put them in good condition again. The arch of corrugated iron formerly made rested upon iron girders, which, although they did not require to be as heavy as the girders for supporting brick arches, were nevertheless heavy and costly, and this expensiveness prevented the introduction of the corrugated iron ceilings into many classes of buildings, in which they certainly would have been used but for the cost. That objection has now been obviated, and the cost of construction of these ceilings and floors largely reduced, by substituting for the rolled iron beams perfectly protected wooden beams, the exposed parts of which are inclosed in a casing of mortar and a sheathing of iron. The improved ceiling has received the indorsement of the architects of Chicago in a public meeting, at which it was stated that the cost of these new ceilings having wooden beams, corrugated arches, and mortar or concrete filling, was but little more than for the ordinary finish of wooden ceilings for store rooms. The sheathed or cased beams cost only one-ninth as much as the iron beams, even at the present low rates for iron. The object of fire-proof construction is to confine a fire to the room in which it originates, but, as the Chicago and other large conflagrations have demonstrated, a fire-proof building may be destroyed by a fire exterior to it, or one which develops enough heat to crumble stone and brickwork. In other words, fire-proof construction must be generally introduced before it can avert the dangers of such sweeping conflagrations as those of Chicago and Boston; hence the importance of any improvement cheapening the cost of fire-proof ceilings and floors, and making them available in all classes of buildings.—*Iron Age.*

Electric Lighting at Liverpool.

At a special meeting of the Liverpool Town Council held Sept. 3d the Mayor (Mr. T. B. Royden) in the chair—the minutes were presented of the Library, Museum, and Art Committee. These contained the following, among other recommendations:

That the tender of the Liverpool Gas-fittings Company, Limited, for running lead pipes, altering iron pipes, supplying and fixing iron rail, including iron scroll and wood work, at the Picton reading room, for the sum of £163 10s., be accepted.

To approve the report of the Borough and Water Engineer, containing the following estimate of the cost of the necessary buildings and apparatus for lighting the Picton reading room by electricity, and a comparative estimate of the annual cost of lighting by gas and by electricity:

CAPITAL ACCOUNT.

Engines, machines, etc., to be provided by the British Electric Light Company	£729
New engine house, foundations for engine, door through wall, etc.	225
Glass screen, etc	30
Central column, etc	80
Contingencies, 5 per cent	50
Total	£1,114

That the Borough and Water Engineer be instructed to arrange with the British Electric Light Company, Limited, for the supply of an engine, machinery, and fittings for lighting the Picton reading room and other parts of the building; the engine to be for ten lights of 4,000 candles each, and the other apparatus for three lights, including six lamps, at a cost not exceeding £729.

That the tender of Mr. Henry Firth for erecting an ornamental column in the Picton reading room for the electric light for the sum of £75 be accepted.

Mr. Picton, in moving the adoption of the recommendation, stated that the Committee had decided to have an alternative mode of lighting the reading room by gas in the event of anything going wrong with the electric light.

After some discussion on the first recommendation—

Mr. Picton said that the Corporation had gone to Parliament, and after considerable expense obtained an act to enable them, to a certain extent, to carry out a system of electric lighting. The first scheme that offered itself in fulfilling the object of the act seemed to be the lighting of the new reading room, and the committee had given the matter the greatest consideration. He might state that the engine would do considerably more work than was now required, so that there would be spare power to carry out the light further to illuminate, if necessary, St. George's Hall, the Walker Art Gallery, the Derby Museum, or the esplanade in front.

Dr. Cross said that the electric light would not compete with gas so far as cheapness was concerned, but its contingent advantages were great.

Mr. J. B. Smith considered the committee would not be justified in charging the whole of expense to capital account.

Mr. Yates asked why the present engine at St. George's Hall could not answer the purpose.

Mr. Bower said they wished to throw the responsibility upon the Electric Light Company that the light should be steady and available for reading. The Company stipulated that the engine should be steady, and the engine they were possessed of now was a very irregular one, the result of which they saw in the Steble fountain.

The recommendations were then unanimously confirmed.—*Journal of Gas Lighting.*

Third Annual Report of the Receiver of the Property of the St. Louis Gas Light Company.

We have received the third annual report of Socrates Newman, Esq., receiver of the St. Louis Gas Light Company, which we give below, together with the Inspector's and Engineer's reports. Want of space prevents the publishing of the other details given in the report at the present time, but we hope to give them at a future day.

CITY OF ST. LOUIS *vs.* ST. LOUIS GAS LIGHT COMPANY.

To the Honorable Circuit Court:—The undersigned, receiver in the above-entitled action, respectfully submits this, his third annual report, and asks that it may be examined and filed. The reports filed each month during the year ending June 5, 1879, taken together contain substantially the same information contained in this report, but the undersigned has deemed it advantageous for the future management of the trust and for the information of those interested therein, to present in condensed and consecutive form the results attained during the three years that he has had charge of such management. The exact condition of the trust at any given date can always be ascertained by reference to the monthly reports, and the exact condition of the trust for any year, or for the entire period, can be seen by an examination of this report.

The total receipts for the year ending June 5, 1879, were one million one hundred and twenty-one thousand nine hundred and twenty-seven dollars and eighty cents ($1,121,927.80), and the total disbursements for the same period of time were one million six thousand six hundred and ten dollars and sixty-nine cents ($1,006,610.69).

Exhibit A gives a detailed statement of the sources of these receipts and the objects for which the disbursements were made.

In Exhibit B is presented a full statement of the condition of the trust on the 5th day of June, 1879, together with a concise showing of all receipts and disbursements from the date of the appointment of the undersigned as receiver down to said 5th day of June, 1879.

Exhibit C presents the prominent features of the business of making and selling gas, as conducted the year previous to the appointment of the undersigned, and also during the three years the undersigned has been in charge of the works. The table of this exhibit has been very carefully compiled and will be found to be full, accurate, and reliable.

Exhibit D is designed to show, among other facts, the quantity of coal in fact carbonized for each one thousand cubic feet of gas made in the years ending June 6, 1876, 1877, 1878, and 1879. Also the average candle-power (tested at the general office on Oliver street) during the same periods of the gas made. Also the quantity of gas actually lost by condensation, leakage, and other causes.

Attention is called to the report to the undersigned, embodied herein, of T. G. Lansden, Engineer and Superintendent, and Exhibit E, accompanying the same. The exhibit is full, and gives the quantity of coal carbonized each month during the year, its yield, its illuminating power, tested at the station works, the quantity of lime used, number of retorts in operation each month, and the amount of the pay roll at the station works for each month in the year. In connection with the report of Mr. Lansden and Exhibit E, the undersigned deems it his duty to call the attention of the Court to the following facts: It is essential to avoid serious danger to life and property from explosion that the purifiers should be changed only during the day time, so as to prevent the use in proximity to them of all lights. But owing to the limited purifying surface at these works, it is necessary during the winter months, when the largest quantity of gas has to be made, to change a portion of the purifiers twice in the twenty-four hours, and one of these changes has to be made at night. This change at night is always attended with great risk of explosion. To avoid this danger the purifying surface ought to be increased with as little delay as possible.

All well appointed works are provided with duplicate engines, boilers, exhausters, and other machinery indispensable in the manufacture of gas, the object being to prevent a suspension of the work of manufacture in the event of an accident disabling any necessary part of the works. But the station works in charge of the undersigned have no duplicates of these necessary parts, and in case of any accident rendering any such part unfiit for service, the work must be suspended until necessary repairs can be made. The danger attending this condition of things is that if any injury to indispensable parts shall occur, requiring any considerable time for repair or replacement, the portion of the city dependent on these works for a supply of light will be left in darkness. In the judgment of the undersigned the proper precautions against such a result ought to be taken, and duplicates of indispensable machinery supplied without delay.

In view of the sources of supply of coal used at these works being remote, and also uncertain, because dependent upon the varying stages of water in the Ohio river during the boating season, it has been the practice, and it is necessary, to carry a considerable stock of coal on hand This coal must be protected from the effects of the weather, and the sheds heretofore used for that purpose are old and have become dilapidated, and ought to be replaced by new and more substantial structures. And there ought also to be provided for the transportation of coal from the river to these sheds an elevated tramway, thereby saving the present tedious and expensive method of hauling in wagons. In the judgment of the undersigned, properly constructed sheds and a practicable tramway, as above suggested, would result in a saving on the coal consumed at these works of at least $10,000 per annum.

The undersigned further reports that the erection of the ammonia works, heretofore authorized by the Court, are now in successful operation, and will hereafter yield the trust an average revenue of at least $3,000 per annum. This is a net gain, as heretofore this water has not been utilized.

Attention is also called to the report to the undersigned, embodied herein, of John Sobolewski, Inspector, and the tables numbered 1, 2, 3, and 4, accompanying the same. This report and these tables are full, and readily understood. That portion referring to the present defective condition of the mains demands attention. The loss to the trust by leakage, and to the consumer by increased consumption, growing out of the great pressure rendered necessary by the inferior size and honeycombed condition of the mains alluded to, ought to be stopped. To do it a considerable outlay will be necessary, but it will have to be made ultimately, and the sooner it is made the greater the profit attending the change will be.

Exhibit G presents in detail for each month of the year the number of public street lamps in place, the number added, the number lighted, the hours kept lighted, the consumption of gas per hour, and the aggregate monthly consumption.

In conclusion, the undersigned states that the construction of the gas-holder, ordered built by the Court, has progressed with reasonable speed, and will be completed and ready for use on or before the 1st of November next. Owing to the condition of the ground selected as a site for this holder, which turned out to be the bed in part of a former stone quarry which had been filled, and in part solid rock, the work has been somewhat delayed. But notwithstanding these obstacles, it has been found feasible not only to complete the work within the time required, but also to secure foundations that are all that can be desired, and erect a tank which challenges criticism. The stone work is the best of its kind ever done in the city, and all of the appointments are of the most approved quality and pattern. The difficulties encountered in securing the character of foundations insisted upon increased the aggregate cost somewhat beyond the original estimates, but notwithstanding this, the work when completed must, considering its great superiority, be pronounced an economical structure.

SOC. NEWMAN,
Receiver.

INSPECTOR'S REPORT.

ST. LOUIS, June 5, 1879.

SOC. NEWMAN, Esq., Receiver St. Louis Gas Light Company:

Dear Sir—I herewith submit the third annual report of the Inspector's Department to your favorable consideration.

The street main and meter account, arranged in tabular form, will be found appended to report.

I would respectfully call your attention to the "General Remarks," wherein I have endeavored to show the working of the different branches of this department, and suggested a few changes which I deem necessary.

STREET MAINS.

	Miles.	Feet.	In.
Laid to June 5, 1878, as per second annual report..	118	2,247	0
Laid since June 5, 1878 (see Table No. 1, annexed).	4	288	6
By errors found in former Inspector's reports.....		692	0
Total of street mains.....	122	3,227	6

Contents of mains, 91,576 71-100ths, cubic feet.
Average diameter of mains, 5 inches.

METERS.

On hand June 5, 1878.....	572	....
Bought since June 5, 1878.....	473	....
Returned from private houses.....	2,736	....
Set since June 5, 1878.....	....	2,906
Lost and destroyed by fire.....	....	5
Stolen from private houses.....	....	2
Sold to private parties.....	....	57
Condemned and unfit for use.....	....	317
Balance on hand June 6, 1879.....	....	494
	3,781	3,781

NUMBER OF CONSUMERS.

Number of meters in private houses, June 5, 1878...	9,889	....
Set since June 5, 1878	2,906	....
Returned since June 5, 1878	....	2,836
Private meters	....	317
Balance consumers	....	9,742
(Increase over last year, 170.)	12,795	12,795

SERVICES.

The column in Table No. 2, headed "Services Laid," shows 420 services introduced into private houses, as also the number of feet of tubing used for same. This branch of the department is treated more fully in "General Remarks."

PUBLIC LAMPS.

Lamps in use June 5, 1878	3,687	....
Erected since June 5, 1878	76	....
Suspended by City	....	98
Balance in use to date	....	3,665
	3,763	3,763

The 76 lamps erected since June 5, 1878, required 2,211 feet of service pipe, or an average of 29.1 feet per lamp at an average cost of $17.24 per lamp.

THE PHOTOMETRICAL TESTS

Of the illuminating power of the gas are shown in Table No. 4, and show an average for the year of 14.98 candles in 305 tests.

GENERAL REMARKS.

I am sorry to feel compelled to begin my General Remarks by stating that we are still laboring under the former difficulty of excessive high pressure in consequence of small mains in the business portion of the city.

With the exception of the replacing of the main on Commercial street, between Walnut and Market streets, which was necessitated by the complete rottenness of this pipe, all other mains treated in my former report are still in the old condition, excepting slight repairs made necessary by breakage from frost, leaky sewers, broken water pipe, or the general decayed condition of the old mains.

The cost of replacing these mains is so enormous, and would cause so much annoyance to traffic and the public generally, that I am at a loss to suggest an immediate remedy. Certain it is that these mains must be replaced sooner or later, and a large circulating main laid along Main or Second street, from the Works to Olive or St. Charles street, thence westwardly, according to elevation, to Fourteenth street, and south to connect with Lafayette avenue main, or the pressure must necessarily increase with the consumption, and vice versa. There is also the danger of the escaping gas following the course of the atmosphere and producing a dangerous explosive substance which may destroy life and property. Many persons, when smelling escaping gas, thoughtlessly take a light to trace it up, and thereby produce the very result they wish to avoid.

The Nicholson pavement on these streets is very expensive, and when once broken is almost completely ruined. The work would be often interrupted, and the cost of replacing these mains with all proper connections to houses, stores, lamps, etc., would be more than twice the usual amount.

In view of all these difficulties, I deem it advisable for the city to act in unison with us, and when a street pavement is to be reconstructed, all underground improvements should likewise be put in good and lasting condition. It is but too often the case that as soon as a street is laid down it is torn up again and the tie broken by the work of plumbers, sewer-men, or gas companies.

The past winter has been extreme in its severity, and has tested our capacity and mechanical ingenuity to the utmost, and I am glad to state that, even with the unfavorable condition of our mains, by dint of increased help and unremitting attention day and night on the part of officers and employees, we have been able to keep the consumers and lamps in light.

SERVICES.

For many years, and, in fact, as long as gas has been or will be sold, the charge for services has been an annoyance to the gas company and a bane to the consumer.

This annoyance is principally caused by the grading of prices according to size and length of service, and, although strictly correct, is seldom properly understood.

Another source of annoyance is the difference in the cost of services of different gas companies in the same city.

A man wishing to introduce a service into his house north of Washington avenue, in the Laclede district, is charged a fixed amount, may this service be long or short, large or small in diameter; while for his housse south of Washington avenue, in our district, he pays only for what he receives, yet the difference causes much dissatisfaction. Should our charge per foot be less than the fixed rate of the other company, the party goes away smilling, but should it be more, on account of long distance, we are at once set down as a monopoly and a swindle.

In my opinion the service should be the property of the gas company, and I am fully convinced that the consumption of gas would be largely increased if inducements, such as bringing gas into houses, or even to the building line, would be made to consumers, with a fixed charge for tapping the main and keeping the service in repair.

METERS.

In connection with this subject, I beg to state that we are greatly in need of a new and larger meter prover. Every meter sent out and brought in, and also all the meters repaired, are tested, and our five-foot prover is entirely too small for this constant demand, as well as being nearly past repairs.

The table of meters set and returned shows the number handled during the year, increasing and insuring a consequent reliability of correct registration.

PUBLIC LAMPS.

No expense has been spared to put the public lamps in the best possible condition, and a great number of worn-out lamp services have been replaced by this department during the year. The necessity of establishing lamplighter station houses in different parts of the city has materially increased the cost of lighting the same, and it is almost impossible for us to keep inside the amount allowed for this work annually. The severe winter has also added considerably to this cost, and makes it greater in the aggregate than is usually the case.

In conclusion, I am happy to state that the department has never worked smoother and more to the purpose, and that Mr. Julius Rapp, as assistant, and the employees of this department deserve the best thanks for the cheerful and workmanlike manner in which everything demanded of them has been executed.

Respectfully submitted,

JOHN SOBOLEWSKI,
Inspector for Receiver.

ENGINEER'S REPORT.

STATION WORKS, June 1, 1879.

SOCRATES NEWMAN, Esq.:

Sir:—In presenting this my second annual report of the operations at the Station Works during the fiscal year ending June 1, 1879, I have no reason to feel otherwise than encouraged at the result.

I present what has been done in tabular form, that you may readily compare it with the work of former years.

As a consequence of a few changes I desired to make, to which I called your attention in my last report, I am able to show by the increased yield that they have already more than paid for the expense. Our make of gas has been greater than any previous year (the electric light notwithstanding). Had I only made as much gas this year as was made in 1876–7, the saving of coal would have been 65,390 bushels, but as I made 18,788,000 cubic feet of gas more, the saving of coal over that year is 28,695 bushels.

The purification shows something better than last year, but could be materially improved had we more purifying surface.

A new purifying house is very much needed, especially in the winter, as I often have to fill purifiers after night, which is dangerous to the men and to the works.

I have kept a complete record of all retorts under fire, also a record of all retorts idle for cleaning, and during moonlight.

The average number of retorts under fire for the year has been 110, and the average number in use has been 107, or a fraction over 2½ per cent. idle. The make of gas to the retort has been 2,990,514 cubic feet, or something over 6,000,000 to the life of a retort.

I have had no occasion to change my mind in regard to our coal, for I can still say that it has given a better result than any I have ever used.

The amount of coke required for running the benches has averaged about 46 per cent. since we commenced selling the tar. The sale of coke has amounted to 669,672 bushels.

The general repairs of the Works have been kept up, and the Works are in about as good condition as they were last year, less the natural wear and tear.

It is with pleasure I acknowledge the valuable assistance and courteous

treatment I have received from the officers and all those connected with me at the Station Works.

Respectfully submitted,

T. G. LANSDEN,
Engineer and Superintendent.

EXHIBIT E.—*Engineer's Report of the Operating of the Station Works, St. Louis Gas Light Co., for the Fiscal Year ending June 1, 1879.*

Month.	Pounds of Coal used for Gas Making.		Cubic Feet Gas Manufactured.	Yield of Gas per lb. Coal.	Average Illuminating Power of Gas. Candles.	Bushels Lime used in Purification.	Cubic Feet of Gas Purified per bushel Lime.	Average number Retorts in operation.	Amount of Station Works Pay rolls.
	Pittsburg.	Kanawha Cannel.							
June 1878	3,109,690	350,850	18,248,000	5.27	16.07	1,072	17,022	75	$5,976 00
July 1878	2,859,100	298,350	16,622,000	5.21	16.04	911	18,245	72	5,970 95
August..... 1878	3,107,580	322,800	18,006,000	5.24	16.08	1,051	17,132	72	6,193 75
September..... 1878	3,874,660	387,550	21,812,000	5.11	16.12	1,080	20,196	84	6,033 05
October 1878	5,232,550	497,850	29,316,000	5.11	16.03	1,582	18,530	111	7,187 65
November 1878	6,025,350	590,650	33,379,000	5.04	16.00	1,516	22,017	129	7,498 70
December..... 1878	6,673,825	764,700	37,540,000	5.04	16.07	2,228	16,849	147	8,274 00
January..... 1879	6,677,900	735,575	38,386,000	5.17	16.05	2,186	17,559	147	8,402 15
February 1879	5,571,200	594,200	30,968,000	5.02	15.99	1,678	18,455	138	7,271 55
March..... 1879	5,283,250	631,900	29,781,000	5.03	16.04	1,644	18,114	135	7,859 35
April 1879	4,352,640	485,000	24,637,000	5.09	16.01	1,265	19,475	111	6,806 50
May..... 1879	3,668,025	391,225	21,290,000	5.24	16.04	963	22,107	99	6,513 45
Total.....	56,465,670	6,050,650	319,985,000	5.12	16.04	17,176	18,629	110	$83,987 10

Respectfully submitted,
T. G. LANSDEN,
Engineer and Supt. for Receiver.

Drying Damp Buildings.

It is sometimes of considerable importance that the drying of a new building should be effected in a brief space of time, and sometimes even more so that the means should be at hand for rendering healthy old constructions impregnated by dampness from the soil. M. Ligny has invented an apparatus for this purpose, which is being used in France, and an agency has been established in England. The apparatus for drying includes an ash-pan; a hearth, with rectangular iron fender, about 0.70m. long by 0.40m. wide, and 0.40m. high (the hearth is filled with coke and furnished with an iron plate, which serves as reflector); and ten tubes of iron plate, of about 1m. to 1.25m. long, capable of being lengthened at will, which are placed vertically in the fire in such a way that the lower extremities, extended in the shape of a funnel, cover the hearth almost entirely. These tubes are held by iron props fixed to the fender of the hearth, and are bent in any direction that may be required by means of a screw compass.

When the apparatus is once heated, the cold and damp air passing across the fire is discharged of its dampness and projected very hot against the walls.

A small blower may, in case of need, be attached to one of the tubes in order to convey more hot air to a given point, and also to reach certain parts to which the apparatus could not be brought near. For drying old buildings impregnated from the soil, M. Ligny adopts the following plan: First, to take off all plaster from the walls which are damp and full of saltpetre of the room which is to be done; then carefully to remove all joints to half the thickness of the walls, which is done bit by bit, to prevent any risk of shaking the walls. Wet the walls thus cleared several times, and each time dry them by means of the apparatus, in order to dissolve all the saltpetre existing in the materials, then cleanse the walls with rough brushes. After this clearing, drying, and cleaning has been carefully done, the brickwork not containing any more dampness or saltpetre, it is again heated, and in every part (by means of a brush) covered with a boiling liquid hydrofuge, which is rapidly absorbed.—London *Builder*.

[From London "Journal of Gas Lighting."]

Manchester District Institution of Gas Engineers.

Mr. John Chew (Blackpool) read a paper on

THE DISTRIBUTING APPARATUS FROM THE GASHOLDER TO THE CONSUMER'S BURNER.

Mr. President and Gentlemen—The subject which I have chosen for your consideration and discussion to-day is one of the first importance to a gas manager, both in regard to profitable working and the giving of satisfaction to the customers and the general public, who are the support of the undertaking.

It is of importance to the manager, because, if his mains and services are in bad order, he is handicapped very probably to the extent of 3d. or 4d. per 1,000 cubic feet on all the gas that he sells, compared with his more successful neighbor in an adjoining town, whose distributing plant is in a satisfactory state. We all know that within a circle of 100 miles of this place there are works with a leakage of from 20 to 30 per cent.; whilst at others again the gas unaccounted-for is as low as 4½ per cent. When a manager has to contend with heavy leakage, although it may not have been brought about during the term of his management, he will have many sleepless nights, and that incessant worry which gentlemen present can well understand—explosions, escapes into sewers—gas, in short, cropping up in all sorts of places where it is not wanted. I am not certain where the responsibiiity for escapes of gas, causing damage to life and property, begins and ends, as the law seems to indicate that a company is responsible for any damage caused by escaping gas until after it has passed through the consumer's meter. Regarded from any of these points of view, it is of the first importance that every manager should give his attention, and adopt the best means and appliances that are known amongst us, to accomplish so desirable an object as the reduction of leakage, and the distribution of the gas at as near as may be uniform pressure amongst the burners of his consumers. Bearing these objects in mind, I venture to offer a few remarks and suggestions gathered from my own experience, and trust they will evoke a good discussion, from which we shall all leave this meeting benefited. I take it for granted when the capital of a company is £600 per million feet made,, that £200 is represented by the mains, services, and meters; at least, it is so in my own works.

If we lay down rules for regulating the size of the pipes for internal fittings—on which I shall have something to say further on—we ought ourselves to take care that we do not put pipes too small in the streets. For the sizes and lengths of street mains, I know of no better guide than the tables of the late Mr. Barlow, on consulting which you will find that at 1-10th pressure a

2-inch	main	at	50	yds.	will	deliver	540	c. f.;	at	500	yds.	170 c. f. per hour
3	"	"	100	"	"		1054	"	"	1000	"	333 " "
4	"	"	100	"	"		2160	"	"	1500	"	557 " "
6	"	"	250	"	"		3770	"	"	1750	"	1420 " "
8	"	"	250	"	"		7760	"	"	1750	"	2920 " "
12	"	"	500	"	"		15100	"	"	2000	"	7550 " "
							etc.		etc.			etc.

These distances and sizes I have always found to work well in my own case. If a greater quantity of gas than 550 cubic feet is wanted, say, from a 4-inch main (distant from the next larger or feeding main 1500 yards), either you must have a larger main, or increase the pressure over the whole district to make up for the smallness of the pipe. The sectional area of the trunk mains, in my opinion, should always exceed the united sectional area of all the branch mains taken from it.

With reference to the laying of pipes, I have for very many years past

used turned and bored joints, with a small cavity for filling with cement. I have never had any trouble worth mentioning with the joints being drawn. They are more easily laid than with lead, and much more reliable. I endeavor to lay the pipes so that the tops of them will be not less than 2 ft. 6 in. to the surface of the ground; and I always, where possible, lay them in the footways, and one on each side of the street where the street is wide, and built up on both sides. Some will say this is very costly. So it is, there is no doubt; but it is first cost only, and quite justifiable, when you consider the crossing of the street for every other service pipe, and that the sewer is generally in the middle of the street, where the settlements of the ground take place, drawing joints and breaking pipes; the gas escaping not at the top, but mostly running to the first vent, into the sewer, entailing great expense. Cast iron pipes should be of good tough metal; I have known pipes that were of brittle iron snapped by the tipping of a load of coal in the street. The standard weights and sizes of pipes are generally to be relied on when the pipes are cast vertically in dry sand. I have for the last year or two ceased to use 2-inch pipes, although I have a very large quantity in the streets. What I have used of them, I have had made ⅜-inch thick, and weighing 28 lbs. per yard. This allows a proper strength of metal to get a good screwed thread for the service-pipe, for nothing is more common, when these pipes are light and thin, than for the main to break where the pipe is screwed into it. Another important matter is to have the holes drilled, not chipped, as is common amongst some old gas men, and the disadvantages of which latter system I have had painful experience in past years. The objections to 2-inch pipes are several. First, the cost per yard of a 3-inch main will not exceed by more than 20 per cent. that of a 2-inch, and you have more than double the area for the circulation of gas through it. Again, if you tap a 2-inch main for a ¾-inch pipe, it is as much as you can do, for there is very little thread left on two sides of the pipe to make a good sound joint. Then, should you require a larger service than ¾-inch, how are you to get it, without cutting the main in two parts? These objections are both overcome by adopting the 3-inch main as the minimum size. I endeavor to have as few blank ends of mains as possible. Further, I have a system of testing the pressure on the 20 miles of main in my district at 50 different points about twice a year. This is easily done by taking off the lamp burners and putting on the gauge; and any engineer who adopts this course will not readily discontinue it, as it gives him a key to the whole system of pipes under his charge. I have all of my tests for years past tabled for reference for my own personal use, and it often surprises me to observe how the pressures vary from year to year, and during the year, as the increased or decreased demand comes on to the mains.

I now ask your attention to the service-pipes, and will begin with the street lamps, all of which I fit up with ½-inch lead-pipe of 3 lbs. weight to the yard, best soft lead, attached to the mains with brass ferules having ground joints. I have specially-made plates with tinned and screwed ends for tap and lead pipe. I adopted lead for this purpose about four years ago. The rusting of the wrought iron tube was so rapid, caused by the presence of the salt water and sea gravel, that, although I tried the best steam-tube for years before, I could not get it to stand more than three or four years. In the case of the house services, where they had to come from the middle of the street, they were eaten through in the channels, where the pipes were subject to damp or wet. When ground is dry or sandy, however, wrought-iron will answer; but, for my part, I prefer lead, laid in timber-troughing, to any of the plans of pitching and troughing that is now being adopted. It is handier and simpler for medium size of works, where boiling pitch cannot well be taken to every small service that is put on. Again, the lead when taken up is worth 70 per cent. of its first cost, whereas old wrought-iron tube is worth nothing, and, indeed, you can scarcely give it away.

Coming to another part of the service-pipe—viz., the end going into the building, I think it is wise, after the experience we have had in the law courts, not to allow the service-pipes to be buried under the flagged floors of consumers dwellings, but to have them nearest to the outer wall of the house, or in such a position that access can be readily had to the pipe for the stoppage of leaks, remembering that should any accident take place from that cause, the responsibility rests with the gas company up to the meter, and damage sustained might be recovered in a court of law. I think it quite time we gave more attention to these matters than they have hitherto had at our hands.

To sum up the question of unaccounted-for gas, and the proper method of ascertaining its amount, let me say that the station-meter should be sufficiently large, and not driven above 100 revolutions per hour; should have a self-acting water line for filling to, and the gas should not exceed the temperature of the air when measured. If these were attended to by all, there would not be such apparent differences in the make per ton as there are at present. Another thing is to state correctly how many feet per hour is taken for the consumption of each lamp, with average high and low pressure throughout the night. The gas used on the works should be measured not estimated.

In the works of which I have charge, the make of gas last year, ending March, 1879, was 46 millions, at the rate of 10,100 feet to the ton of coal. This spread over 20 miles of mains, and 2700 consumers, with 470 street lamps in addition (the street lamps taking 4½ feet per hour each) gave as a result 9650 feet paid for, or a loss of 4½ per cent. on the gas made; and this latter item, I believe, can yet be reduced to 3 per cent. The coals I use are Wigan 4-feet mine, Orrell Arley, and Lancashire cannel, in proportion to make gas of from 18 to 20 candle power.

I believe if we endeavor to give a good supply of gas at not less than 16-candle power, and deliver it into the consumers's meter at a pressure not less than 10 or 12-10ths, nor greater than 20-10ths during the hours of burning, there will not be much cause of complaint.

The meter should be attached at the point where the service-pipe terminates, which point should be determined by the gas manager. The rule I adopt for the number of burners, to be supplied through different-sized meters, is as follows:

2-light meter	.....	4 burners.
3 "	.....	8 "
5 "	.....	12 "
10 "	.....	20 "
20 "	.....	50 "
30 "	.....	70 "
50 "	.....	100 "
80 "	.....	150 "
100 "	.....	200 "
150 "	.....	300 "
200 "	.....	400 "

Of course, I cannot pretend to fix a hard and fast line from which there is no deviation, but I adhere as near as may be to the above sizes, and especially in the first instance, when the supply is being laid on.

With respect to the meter itself, I have, after 15 years' experience of dry ones, given up their use entirely some years ago, and although I have some two or three hundred in use out of 2700 of all sorts at work, as they come out, I never put them in again. Their registration is not to be relied on either for the company or the consumer, after they have been at work a few years. You may take one out that has been, say, ten years at work, and find it quite correct; and you may take two or three others and find none of them correct—one may be in favor of the company, the other in favor of the consumer, and either of them will vary at different pressures. After standing a little while, I have been annoyed with them causing all the lights to lift when set to work again. Leaks at the dials, also, are very common in dry meters. In my opinion, a good, well made, plain wet meter is not to be surpassed; but I hold it to be of the first importance that all wet meters should be inspected and proved for correct water line every two months at least. If this is not done, depend upon it, more will be lost by far than what the inspectors wages will amount to. I am not now referring to the taking of the index, but the watering only.

I now come to another stage of the subject, and a very much debated one it is. I allude to internal fittings. Some three or four years ago, I framed a code of regulations for the guidance of plumbers when fiting gas pipes; and although we had not the power to enforce them at law, still, after a good deal of trouble at first, they came to be generally adopted. We could not get the regulations referred to drafted in our new Act passed this year; but we obtained power to make bye-laws, subject to the confirmation of the Local Government Board, and these bye-laws embody the whole of the regulations.

The following are the sizes and lengths of pipes to be used in premises according to the number of burners, viz:

⅜-in.	tube,	not exceeding	20	ft in length	to supply	no more than 3	burners
½	"	"	30	"	"	6	"
⅝	"	"	40	"	"	12	"
¾	"	"	50	"	"	20	"
1	"	"	80	"	"	40	"
1¼	"	"	100	"	"	60	"
1½	"	"	150	"	"	100	"
2	"	"	200	"	"	200	"

On the completion of the work of fitting, and before the pipes are covered up, notice in writing must be sent to the manager, who will cause the work to be inspected, and if found in accordance with the above regulations, gas will be laid on; if not, the committee reserve to themselves the right to refuse a supply until the necessary alterations are made.

The plumbers now carry them out without much trouble to us, but often neglect to send us word to inspect; but when our inspectors are going about their eyes are open to any breach, which is at once reported, and a sharp letter sent to the offending plumber. Their adoption has been just what was wanted, and we have several hundreds of houses so fitted and giving every satisfaction.

Having now gone over all that I intended, I will leave to some other gentleman the question of the best burner for the million; merely remarking that my rule is to give any consumer a burner who will ask for it, providing ourselves with a stock for that purpose.

The President (Mr. T. Newbigging, Manchester) invited discussion, and,

Mr. D. Clarke (Ashton-under-Lyne) said the paper read by Mr. Chew was a practical one, and well worthy the consideration of the members. Mr. Chew advocated having his trunk mains of equal area to all pipes branching from them; he doubted whether this could be done in practice. The feasibility of doing so would, he thought, depend greatly on the size of the mains and their respective lengths. With regard to having two mains in some streets, it might be that the additional main would more than equal the length of the service-pipes to be laid from it, which would be a positive disadvantage of the system, not to mention the other drawbacks attending its adoption. As to lead service-pipes not being much affected by salt water, no doubt that was a proper argument to use as regarded Blackpool, and, of course, there was the advantage in their use that they could be sold, when worn out and taken up, at three-fourths their first cost. Service-pipes, whether lead or iron, should never be laid under the floor of a house, and he never allowed it. His experience was that the wet meter was much more reliable than the dry, and, therefore, more satisfactory. He quite agreed with Mr. Chew that it was desirable to have control of the men who did the internal fitting, in order to ensure pipes of ample size and good workmanship. He was not in the happy position of Mr. Chew in regard to leakage, for at Ashton-under-Lyne it was 11½ per cent., though that by most managers was considered reasonably low. Attention to the consumption in the public lamps was a matter of great importance, and would reward any manager who devoted a portion of his time to the subject.

Mr. John Hutchinson (Barnsley) said that the district supplied by his company was extensively undermined through colliery operations, the ground frequently sinking and breaking the pipes; his leakage was consequently heavy, being almost 17 per cent. It had been as low as 10, and as high as 21 per cent. He had tried turned and bored joints, and also joints made with lead, but he found that whichever joints were adopted a policy of constant attention was required. If the various matters touched on by the author of the paper were minutely observed, it would be for the benefit of all concerned.

Mr. Dalgliesh (Glossop) agreed with Mr. Chew that the mains should be protected both from the effects of frost and overhead traffic by being laid at a depth of about two feet. He had a large and straggling district to supply and, owing to the difference in level between the works and the lower parts, he had to keep an excessive pressure in the mains, both by night and day, which had the effect of making his leakage about 22 per cent. Owing to the bad state of the fittings that had prevailed in his district, he had recently adopted a code of regulations similar to those mentioned by Mr. Chew, and with satisfactory results.

Mr. Smith (Hyde) objected to a main pipe on both sides of the street, as expensive and unnecessary, and thought that lead service-pipes would have a tendency to sink in parts of their length, allowing water to accumulate, and so cause much trouble to the company, and annoyance to the consumers.

Mr. Hartley (Blackburn) had had considerable experience with lead service-pipes at Blackburn, and, whilst admitting that they sometimes sunk and gave trouble, he recommended their use because they kept down the leakage, which in Blackburn was only about 8¼ per cent.

Mr. Carr (Halifax) expressed his surprise that the leakage per mile of mains had not been mentioned, because what was 50 per cent. in one case might only be 5 per cent. in another. Suppose, for insiance, a pipe passed 10,000 feet of gas, of which 500 feet was lost, the leakage was 5 per cent.; but if the quantity of gas passing was doubled, the leakage was reduced one half, and so on. The leakage, he thought, must be less where lead pipe was used for services, as his own experience taught him that the most costly leakages were in the service-pipes, and not in the mains. It was the almost imperceptible leaks which added up at the end of the year, and not so much the large ones, which were easily discovered and remedied. With a low leakage he should expect to hear of a high sale of gas per ton, and if that did not result, be the leakage never so low, there was mismanagement somewhere. With regard to turned and bored joints, as compared with lead joints, he was at issue with Mr. Chew; he considered that lead joints were the superior of the two, and less likely to be affected by settlement of the ground. He allowed no main less than three inches diameter to be used. Internal fittings ought to be carefully supervised; to allow a six-roomed house to have a ¾-inch piping and a 2-light meter was simply robbing the company, as it necessitated excessive pressure over the district to afford the necessary supply. He considered, therefore, that gas companies and local authorities owning gas works, should have the power of inspection, and the licensing of properly qualified persons to do the work of internal fitting. He agreed with Mr. Chew as to the amount of capital, though in Halifax it was £900 or £1000 per million.

Mr. H. Legg (Ossett) had no doubt that the unaccounted-for gas could be kept down to a reasonable amount by attention to the matters pointed out in the paper, and more particularly by strict supervision of the meters. He preferred the dry to the wet, as they required no watering, and less general attention. If he doubted the registration in any case, he had the meter taken out and tested. He was paid for three feet per hour in the public lamps, and probably supplied four and a-half feet, his leakage being 15 per cent.

Mr. Hunter (Stalybridge) said meters in his district were generally the property of the consumers, which he thought was a mistake, as the consumer naturally tried to save expense by purchasing the smallest possible size. The houses were fitted up on the same principle, everything being cramped and necessitating a higher pressure than ought to be required under proper conditions. It was no unusual thing to find a 3-light meter supplying 10 to 20 lights. Much of the unaccounted-for gas could be traced to this cause. Street-mains should be of ample capacity; and, in his opinion, nothing less than 4-inch should be laid, where it was to be tapped for service-pipes.

Mr. W. Hutchinson (Barnsley) said that his experience in regard to meters was quite at variance with that of Mr. Legg. In a growing district turned and bored joints were preferable to lead, as they were more readily taken up, cleaned, and relaid when extensions were required; but in a place like Barnsley, which was undermined in many parts, he preferred lead joints.

Mr. Littlewood (Manchester) did not think managers, generally, took sufficient care to select the kind of material suitable for filling up the trenches when iron pipes were laid. It was well known that ashes, when saturated with wet and damp, would destroy wrought-iron in a very short time, and sand, or clay, or good mould should be used to bed and cover the pipes. He was of opinion that lead joints were tighter and more reliable in ground subject to subsidence. In Manchester they were re-piping districts, replacing turned and bored joints with open sockets, and were hoping thereby to reduce the leakage, which at present was about 9½ per cent.

The President concluded the discussion, which, he said, had been an interesting and useful one. With regard to the question of laying a main on both sides of a street, he could not coincide with that suggestion, except in rare cases, when the street was of unusual width and the traffic heavy; and principally because it added materially to the capital outlay, whilst the joints of the mains—a considerable source of leakage—were doubled in number. He was, as a rule, in favor of turned and bored joints, and where these had been found to fail it was owing to an excessive amount of taper having been given to the turned and bored parts. All such joints should be carefully made to template, and when this was done, and the turned portions made almost parallel, even in the case of a draw, there was but little escape of gas. In districts like Barnsley, which were extensively undermined, he believed the vulcanized india-rubber joint would be found of the utmost value, as it would allow of a drop in the ground to the extent of 6 or 8 inches without causing leakage, provided the pipe remained unbroken. He considered that, generally, the maximum pressure should not exceed 20-10ths, and when there was a necessity for more, an enlargement of the most contracted mains should be made. In the matter of internal fittings, managers, by judgment and tact, could exercise a very wide and useful supervision even without the aid of statutory powers. A gas manager who did his duty usually commanded a good deal of respect in his locality, and his advice in regard to such matters would generally be accepted and acted upon. In very large towns such personal supervision on the part of the manager was impossible, and under these circumstances, statutory regulation was most desirable in the interest of the consumers themselves. Reverting to the subject of leakage, he had just been making a rough calculation that in this country about 90,000 million cubic feet of gas was made per annum. Supposing the leakage on this to be 10 per cent., that would be 9000 millions, and taking this quantity at 2s. per 1000 feet, the total money value of the leakage would be represented by £900,000. Here was a mine of wealth in which all gas managers might dig, and of which they all might secure their proportionate share. He concluded by moving a vote of thanks to Mr. Chew for his very practical paper.

This was seconded by Mr. Smith, and unanimously carried.

Mr. Chew, in reply, said he was obliged to the members present for the vote of thanks that had been passed to him. In answer to some of the opinions that had been expressed on sundry points to which he had referred, he desired to say that in laying the lead service-pipes he placed wood casing underneath them, and made it of extra strength in crossing sewers and other places where subsidence was possible. Fourteen years ago his leakage was 33 per cent. He did not, however, ascribe the improvement that had since taken place to the use of lead services, as he had only recently adopte them; but to careful general inspection.

A vote of thanks to the directors of the Barnsley Gas Company was moved and carried, after which the meeting terminated.

Competitive Examinations and Cramming.

In a leader on the subject of competitive examinations and the cramming system generally, the *Times* makes the following apposite and incisive remarks:

"Several circumstances have combined of late to direct attention to the subject of examinations. Cambridge, as we saw a short time ago, is forced seriously to consider the system of entrance scholarships; and a correspondent has recently invited attention to the mischievious system of entrance scholarships established in public schools. Even if examinations were a good in themselves, it would still be possible to have too much of a good thing, and very many competent judges are already beginning to dread an educational surfeit in this respect. But, to our thinking, examinations, so far from being a good in themselves, can hardly be placed higher than the category of necessary evils. They are a burden to the examiner and to the teacher, exactly in proportion as each is efficient and conscientious, and they are very far from being an unalloyed benefit even to the examinee. But they are not the less in many cases necessary; they are at least a rough test of merit, capacity, and attainment, and therefore, where these have to be tested for any specific purpose, it is hardly possible to dispense with examination altogether. But to admit this much is very far from saying that examinations should be made, what they are fast becoming, the be-all and end-all of educational processes. From the tender age of ten or eleven to that of manhood and upwards nearly every boy of promising parts in this country lives with the constant fear of examination before his eyes. If he is more than usually successful, at the end of the process he is likely to enjoy for the next few years, or, indeed, as long as he chooses, the distinguished privilege of examining his juniors in their turn. Thus the examination fever spreads far and wide. It spares neither age nor sex; for women, with singular perversity, have claimed as a privilege what boys and men alike regard with aversion. It has long ago pervaded education, and its contagion is now beginning to infect the whole range of modern letters. Literature, ancient and modern, is regarded as so much material for examination to be reproduced in the form best calculated to win marks in a competition. History is cut up into "periods" and "epochs," and then reduced into summaries, so that whoso runs may read or teach, examine or be examined. The old Universities, which once could boast of a learned press and still occasionally publish works not unworthy of English scholarship, devote their chief literary energies to the publication of manuals required in the various examinations they have undertaken to conduct. The work is excellently done, no doubt, though it is hardly of a kind which befits the dignity of an Academical press. But the examination spirit is rampant, and the Universities are forced to yield to it. The pity of it is that they take to the task so kindly and seem so entirely contented with it.

"The evil of all this is unquestionably great and growing. We need not dwell on the disastrous effects, well known to schoolmasters and college tutors, of the premature forcing for the purpose of competitive examination to which so many boys of tender years are now submitted in public schools. It is rather to the general effects of the modern tendency to make examination the sole test and crown of all processes of education that we wish to draw attention. This tendency entirely distorts every rational view of what education is and should be. It makes of the pupil a mere racer, and one who contends for heavy pecuniary stakes. It makes of the teacher a trainer whose whole prosperity depends, not on his power of imparting sound knowledge and drawing out the natural capacities of the mind, but on his skill in preparing his pupils for a particular competition. It makes of the examiner a judge, not of mental capacity and sound information generally, but of those qualities alone which are readily estimated in marks. In addition to all this the system tends inevitably to force teaching and examining alike into a narrow and mechanical groove. Even if a particular teacher has a special taste and regard for some subject out of the ordinary range of the examination for which he is preparing his pupils, he dare not lead them in the direction in which he would probably do them most good, for fear they should fail to get credit for their work in the coming ordeal, on which their whole success in life may depend. He is forced to scan with anxious scrutiny the line that the examination has previously taken, in the confidence, very rarely misplaced, that it will take the same line again. For the examiner knows that he, too, must not go beyond certain well-understood limits. If he does he will be regarded as crotchety, unfair, and pedantic. Every experienced teacher knows to his cost how the attempt to lead his pupils toward some collateral line of study not directly recognized as an examination is frustrated at once by their refusal to take any interest in subjects that will not "pay." Every examiner knows that the insertion in his papers of a question lying somewhat out of the recognized range and groove is simply so much waste of time and labor. Hence, under the influense of examinations, the treatment of every subject, great and small, is divided, by an impassible barrier, into the dark and boundless range of the neglected and the unknown, which the teacher must leave unnoticed and the examiner dares not explore, and the narrow field, brilliantly illuminated and minutely surveyed, which the pupil is taught to regard as alone worthy of notice.

"Even thus we have not exhausted the evil effects of thus substituting examination for education. The whole system gives the successful competitors an exaggerated sense of the importance of the victories they have won. It unduly stimulates that earlier efforts, while it paralyses their later and more mature energies. A high wrangler or a first-class man thinks that the battle of life is won. He has learned all that he can learn, has done all that he needs to do. He despises knowledge which lies outside the examination range as musty, pehantic, and unprofitable. He thinks meanly of men who have not been examined so often or so successfully as himself. He owes all that he is, and has, and knows to having been examined; he believes in the process, and he aims at nothing higher than being in his turn an examiner himself. Then, indeed, his fate is sealed; he might have been a student, a scholar, or a philosopher if he had not been taught to look at all knowledge through a distorting medium of examinations; he might even have succeeded in life, in spite of early obstacles and mischievous trainng, if he had not been taught to believe that that success was already won at its outset. But he becomes a mere subordinate wheel in a vast and exacting machine; his existence is passed in a weary and monotonous round of setting papers and looking them over, of assigning marks and adding up their total, of comparing results with his colleagues, and striving to gauge human nature by impossible measurements and fallacious standards, until at last he comes to believe that there is no better fate in store for human beings than to become just what he is himself.

"The picture we have drawn is highly colored, perhaps, but it will the better serve to illustrate the inevitable consequences of making examinations supreme, instead of keeping it in proper subordination to the highger purposes of education. It used to be said that in some districts of England a man could be supported by charity from his cradle to his grave. We have changed all that, and in the place of indiscriminate charity we have established the supremacy of examinations at every turn in life. Is the result so satisfactory that we can regard it as final and irrevocable? Is it not possible that, as so often happens, we have confounded ends with means, and made a successful examination the paramount purpose, instead of merely the indispensable test of educational training? What, in fact, is the actual result? Education is doubtess improved in its lower ranges, and the public service of the country has been purged of mere favor and nepotism. These are valuable and indisputable gains, but they would be purchased dearly at the sacrifice of high aims in academical culture and the absorption of some of the best capacity of the country in a kind of work which extinguishes original study and paralyses all intellectual independence. If we persist in absorbing some of the best capacity of Oxford and Cambridge in the perpetual conduct of trivial and elementary examinations, can there be any reasonable chance of those universities producing results proportionate to their fame and endowments in the real work of learning?"

Such sentiments, coming from the leading journal, will be read with gratification by all true friends of education, who will rejoice to see the *Times* joining in the battle against the cram system—a battle which the *Chemical News* has fought unflinchingly from its first number.—*Chemical News.*

Light in the School Room.

It has been said that shortsightedness is a product of civilization. Where education spreads, there we notice the prevalence of myopia. When, in 1870, the Germman legions poured into France, we were told that it was the schoolmaster who had won the battles, who had done more to defeat the French armies than all the strategy of Field Marshal von Moltke; but, at the same time, we had from all sides descriptions of the surprise produced by the appearance of the sturdy Teutons, whose marshal aspect was somewhat marred by the number of spectacles worn under the *pickelhaube*. These great political events impressed on all Europe the necessity of educatiod. Whatever mischief may have resulted from this war, it must be owned that even the French themselves are indebted to German prowess for the stimulant given to the cause of education. But, at the same time, the spectacles worn by these educated victors were not altogether forgotten. They were first of all made the subject of much ridicule, and the Germans, who, in spite of their great victories, do not seem able to tolerate a joke, took the matter keenly to heart. Searching inquiries have been instituted, and it is from Germany that the bulk of the statistics on this subject are forthcoming. For instance, Dr. Herrmann Cohn, of Breslau, finds from observations made on 10,060 pupils, that the proportion of shortsighted children was in the rural primary schools, 2 per cent; in the urban schools, 9 per cent.; in the middle-class schools, 15 per cent.; in the superior schools for girls, 18 per cent.; in the royal schools, 44 per cent.; and in the gymnasiums, 55.8 per cent. He is of opinion, therefore, that shortsightedness is developed in proportion as education becomes of a higher degree.

Such a conclusion, we need hardly remark, would have a disastrous effect, and the highest interests of humanity are concerned in rectifying this state of affairs. Of course the figures we have quoted must not be taken as final; but it is nevertheless a fact that study, reading, will undoubtedly produce a deterioration of the sight, unless it is practiced under improved circumstances. Unfortunately, while on all sides children are driven into schools and made to study in greater numbers and for longer hours, little has been done, comparatively speaking, to preserve their sight. The visual organs of the population are exposed to an over-great strain, and this, as often as not, in schools that scarcely afford any better light than that which enabled our ancestors to acquire their meagre quota of education. It does not suffice to improve the schoolmaster, the school-book, etc., we must also ameliorate the school desk and the school window. In the States of Southern Germany this has been understood, and in nearly all the books written on the subject, whether official or otherwise, directions are given to the effect that "management of the sight during school hours should be the object of constant care. It is absolutely necessary that in all school rooms the light should be ample and well distributed.

While various researches have proved that education injures the sight, that this mischief manifests itself more or less rapidly according to hereditary predisposition, but is almost invariably developed during the school period, Dr. Liebreich has experience to prove that the injury is most extensive in those schools where the light is distributed in an unscientific manner; and it is on this opinion that we base our hope for the future. No one can deny that the sight of the present is far inferior to that of the previous generation; but as the knowledge of the evil becomes general the matter will become one of scientific study, and satisfactory remedies may be discovered. In fact, this is already the case, though the subject has not yet attracted as much attention as it deserves. Further, we would urge that any negligence in this respect is all the more culpable, as other and grave evils result from the same cause.

Of course, it is well known, and we need hardly repeat, that light is a powerful disinfectant; epidemic diseases do not spread so easily in a school room exposed to the sun's action. It is not to this, however, that we allude. Mere light is an insufficient remedy unless it be properly distributed. If this is not done, the children will seek to relieve the fatigue of their eyes by twisting round and assuming unnatural attitudes. Unnatural and extraordinary habits are thus acquired, and often maintained when the original cause and excuse is removed. The consequence of such habits, contracted when the body is developing, are most disastrous; and to this simple cause many cases of deviations of the spine may be traced. Thus, in Switzerland, out of a number of boys examined for this purpose, 20 per cent. had one shoulder higher than the other; while the proportion among the girls was equal to 40 per cent. Out of 100 cases of deviation of the vertebra, 90 could not be traced to any special disease, but had been developed during the school period. This may be, it is true, the result not merely of inefficient light, but of unsuitable desks or seats. Nevertheless, we may conclude, with Dr. Liebreich, that "the child assumes a wrong position, and becomes deformed because he is growing shortsighted, and that he becomes shortsighted because he sits in a wrong position, and is growing deformed."

The moral to be deducted from all these facts will scarcely be disputed. Other statistics may be brought to bear, less startling in their general character, and other explanations in extenuation of the evils may be given; but still, speaking in a broad sense, everyone will agree, firstly, that there must be a plentiful supply of light in all schools; and secondly, that this light must be distributed in a manner proved theoretically and practically to be correct and beneficial. But on this second point opinions are unfortunately divided; and, though many persons may have their theories and adhere to them with considerable persistence, there is no golden maxim universally admitted to be correct. The governments of the German States have, however, come to various conclusions on this somewhat difficult question; and their energy in this respect has excited the emulation of the French.

M. Emile Trelat, professeur de constructions civiles au Conservatoire des Arts et Metiers, has energetically taken the matter in hand. This gentleman, who in art and architecture has acquired a good reputation, possesses at once technical and scientific knowledge; and, as the chief architect of the Department of the Seine, can bring great influence to bear on the authorities. He has consequently written various pamphlets, which take the form of letters to the Prefect of Police, and delivered a number of lectures, all urging that, if France is to be as well educated as Germany, this is not a reason why Frenchmen should become equally shortsighted. M. Emile Trelat, in one of his letters, remarks that the Germans are so well acquainted with their weakness in the question of sight, that on the very day (the 28th of December, 1870) when they opened the bombardment of Paris, the State of Wurtemberg issued regulations which he quotes as a model for all nations. We will translate the regulations, as they seem to give those very maxims which, as we remarked above, should be adopted. For each principle laid down there are many arguments adduced:

"The windows should be so placed that the light may be to the left of the pupils.

"Light coming from the head of the class—that is, from behind the master's seat as he faces the class—should be absolutely condemned.

"Opposed lights—that is to say, lights coming from windows facing each other, and pierced on both sides of the class—should not be allowed.

"The total surface of the openings admitting light into a class room, when the building stands out alone, should be equal to one-sixth, but if the building is masked by other surrounding constructions, to one-quarter of the total surface of the floor of the class room.

"The heighth from the floor to the beginning of the window should be at least one meter; as light falling below the table is useless, and may have a blinding effect.

"The depth of the rooms depends principally on the heighth of the windows. The seats opposite the wall next to the windows should be well lighted, and consequently the depth of the room should not be more than one and a half times the height of the summit of the window, the measurement to commence from the level of the tables or desks. The shape of the room for classes of less than 40 pupils should be as square as possible. The greatest care must be taken not to strain the sight of the pupils during work hours. The master must, therefore, observe all that may tend to attain this end.

"To protect the eye against the excessive vividness of the sunlight, he must provide suitable blinds; and he must be especially careful that the light shall not be admitted from two opposite sides. Further, light facing the students must be absolutely suppressed, or at least shut out during class hours.

"In his teaching, the master will also avoid exhibiting maps, the black board, etc., between the windows.

"No work of a nature to tire the sight must be allowed during the twilight."

The other German States have followed the example of Wurtemberg. Their regulations, if not identical, are the same in principle. In South and North Germany, in Austria and Hungary, the principle of what M. Trelat calls a *unilateral* light has been proclaimed. Windows facing each other are absolutely abolished, and these regulations are not only enforced with regard to new constructions, but even the old buildings have, in many instances, been modified. These principles, practiced in Germany, warmly advocated in France, are based on arguments too lengthy for repitition here.—London *Builder*.

The New Petroleum Act.

After "shoddy" came petroleum. Of all sources of wealth, to "strike ile" proved for a time the most redundant. Inherently a better and an honester thing than "shoddy," and all that the term signified, petroleum became at last a good thing very much overdone. Still, it exists, and meets a demand which is itself enormous, though the supply is ever ready to exceed it. Petroleum is to villages and isolated houses what gas is to towns and cities. As a cheap illuminant, it has conferred an immense boon upon the poor, superseding the miserable "dips," which formerly glimmered in the cottages and homes of the working classes. But this otherwise beneficent agent has not been free from fault. Petroleum might almost be called a Protean oil. It appears in many forms, or, as we might say, in many stages of existence, each gradation being maaked by a different of volatility. When the present illuminating gas was first introduced, the public accepted it with fear and dread, owing to an exaggerated an erroneous idea of its explosive character. Petroleum is not, strictly speaking, an explosive oil, any more than illuminating gas is of itself explosive. But, in common with a large class of mineral oils, it is capable of emitting a highly inflammable vapor, the ignition of which may lead to very serious disaster. The vapor emanating from an oil of this description gave rise to the "blue bursticle," as the bargeman termed it, which fired the gunpowder on board the *Tilbury* in the Regent's Canal. Accidents of lesser note are continually occurring from the same cause. Even the ignition of the oil when a lamp is upset is probably due, in a very great measure, to the vapor which is then poured forth. The volatile nature of petroleum has been made the foundation of many projects for either superseding or improving the present gas manufacture, but none of these schemes have been found practically useful, except on a very limited scale. That petroleum may be used as a fuel in the generation of steam is daily demonstrated—as, for instance, on the Caspian. Some years ago experiments were made in Woolwich Dockyard, in order to discover whether oil of the nature of petroleum could be used advantageously as a source of heat for raising steam. The results appear to have been satisfactory, except that the fire was apt to be a little too lively. Three times did the Government engineer have his hair and whiskers singed. He "got used to it,

but the Admiralty seem to have entertained the idea that such accidents might be dangerous on board ship. A solid mass in a state of incandesence like burning coal was comparatively manageable. But a blazing liquid might travel no one knew whither, and to have a fiery fluid running about a ship, diving down into every chink and cranny, was more than British valor could be expected to cope. Hence our ironclads continue to be furnished coal. The burning of the *Goliath* may perhaps be accepted as an approving comment on the discreetness of the Admiralty. The question of cost also has to be considered. At the time of the Admiralty experiments, now thirteen years ago, the price of petroleum was too high to admit of a favorable comparison with coal, despite the great evaporative power of the oil.

The readiness with which petroleum and its congeners give off their ignitable vapor has naturally led to the setting up of a standard representing the temperature at which such vapor is evolved. A line has been drawn which is supposed to separate the dangerous oils from those which are comparatively safe. The petroleum acts of 1862, 1868, and 1871, fixed the standard at 100° Fahrenheit. But it was well known, at the time that the last of these acts was passed, that very much depended on the manner in which the oil was tested. It was to the interest of the importer and others to make the oil endure the test successfully, and for that purpose to have the operation performed in such a way as to give the oil the best possible chance of escaping the law. On the other hand, the safety of the public demanded that the test should be rigorously applied, so that if the oil were really capable of giving off an inflammable vapor at a less temperature than 100°, the fact should be known. When the act of 1871 was passed, it was found impossible to come to a decision as to the best mode of testing petroleum; and there was an especial difficulty in deciding what should be the temperature, for it was apparent that, if a new mode of testing were introduced, some change in the standard would be necessary. Unable at the time to grapple with this part of the subject, the Legislature passed an Act totally repealing the two previous statutes relating to petroleum, and substituting other provisions; but leaving the standard and mode of testing unaltered. With a view to speedy amendment in this particular, the new act was declared to be operative only for one year. In 1872, the question was consequently revived, and a Select Committee of the House of Lords endeavored to give the matter a final settlement. The essence of the controversy had reference to what is termed the "flashing point" of the oil. The oil to be tested was warmed in an open vessel, and a light was applied at intervals to ascertain whether any inflammable vapor was being given off. A thermometer, with its bulb immersed in the liquid, indicated the temperature, and this was made to rise until the vapor flashed in the presence of the light. With this apparatus different operators, animated by opposing interests, obtained conflicting results. Even where an honest intention existed, on either side, to get at the truth, there was a lack of uniformity in the temperature recorded. This mode of testing was called the "open test." Another method was proposed, called the "close test," which it was considered would be free from the defects of the existing plan. The witnesses examined before the Committee were by no means agreed, either in their conclusions or their data, though the majority were of opinion that the close test was decidedly more reliable in itself, and much less open to manipulation than the open test. The temperature to be adopted was the subject of a hard fight, and the issue of the contest in 1872 was simply to leave things as they were, the act of 1871 being kept alive by its inclusion in the Expiring Laws Continuance Act, a method adopted session after session until the present year.

In 1875, the Home Secretary requested Mr. Abel, the Chemist of the War Department, to conduct an investigation into the matter of the petroleum Mr. Abel accordingly placed himself in communication with Mr. Keates, Dr. Letheby, Dr. J. Attfield, Mr. Dugald Campbell, Dr. B. H. Paul, the Secretary of the Petroleum Association, the Secretary of the Scottish Mineral Oil Association, and the Local Authorities of Liverpool and Bristol. Mr. Keates had both advocated the close test, and had devised an apparatus for applying it. As the Consulting Chemist to the Metropolitan Board of of Works, and long familiar with the petroleum question, he was a leading witness before the Select Committee in 1872. Writing to Mr. Abel in 1875, Mr. Keates expressed his belief that the close test was not objected to *per se*, but great difference of opinion existed as to the proper change to be made in the standard of temperature, as what would be required for the purposes of the close test, would probably lead to some misapprehension among the generality of people. We find the Committee arguing that the public, having been "educated in the belief that anything over 100° F. means safety, and below 100° danger, might associate any lowering of the standard with increased risk to themselves, even if such lower standard were explained to as equally stringent and more certain test."

Having thus taken pains to discover whether the principal witnesses who gave evidence in 1872 had gained any fresh light by experience, Mr. Abel carefully reviewed all that was said, and entered on a series of experiments. After this he drew up a very admirable report, which was laid before the Home Secretary in the autumn of 1876. In that report, the old standard of 100°F. by the open test was accepted as sufficient for the protetction of the public, supposing it could be correctly ascertained; but Mr. Abel declared the mode of testing prescribed by the Act of 1871 was not of a nature uniformly to ensure reliable and satisfactory results. To remedy this state of things, he proposed the use of a new apparatus, founded on the principle of the close test, the flashing point being fixed at 73°, this being apparently equivalent to 100° by the open test. With a very creditable degree of modesty, Mr. Abel observed that, although his conclusions with regard to the relations between the old and the new flashing point were based upon the results of a number of carefully-conducted experiments, it appeared desirable that the minimum flashing point to be adopted with the new test should be deduced from the results of a much larger number of experiments, to be conducted by "several independent operators of acknowledged experience in the testing of petroleum." For this purpose he made mention of Mr. Keates, and the Secretaries of the two Associations. This recommendation, we presume, has been carried out. At length, in the session of the present year, the question which has so long been kept in abeyance has received its settlement. A new petroleum act has been passed, which substitutes for the open test that which has been proposed by Mr. Abel—namely, the close test, as improved by that gentleman. The standard is fixed at the proposed in Mr. Abel's report to the Home Secretary. Subject to this change of test, the act of 1871 is made to continue in force until otherwise directed by Parliament. The new act is declared to come into operation on the last day of this year, from which period, therefore, the new system will be adopted. The mode of testing is set forth in the first schedule of the act, which includes a specification of the apparatus. A very excellent arrangement embodied in the act is that of having a pattern apparatus deposited with the Board of Trade. This pattern is called a "model"—a term which hardly conveys the correct idea, seeing that it is a model on a full scale, and is really what we would call a sealed pattern. With this pattern or full-sized model every apparatus designed for the legal testing of petroleum must be compared and verified, and, if found correct, such apparatus will be stamped as evidence of its conformity with the requirements of the law.

[To be continued.]

Regenerative System for Gas Light.

Mr. F. Siemens, of Dresden, Germany, like his brother, a prominent electrician and inventor, has published in the *Verhandl. z. Bef. d. Gewerb.* a valuable application of his regenerative system for gas-light. Starting from the fact that the intensity of the light is increased by an increase in the temperature of combustion, he designed a number of different styles of lamps in which the air for the combustion of gas is heated by the waste gases, the supply of air being regulated by the currents produced by the difference of the temperature of the air, the gas and the products of combustion. The lamp consists of three iron tubes of suitable diameters, placed one within the other, the upper portion of the lamp being enclosed in a spherical globe. The entire space inclosed by the different tubes is filled with wire netting, constituting what Mr. Siemens calls regenerators, and which serve for absorbing the heat of the products of combustion and for giving it off to the gas and the air for burning the latter. The central tube is used for conveying the gas, which enters it from below. The air is admitted from below into the annular space between the central and second tube, while the hot products of combustion descend through the annular space between the second and the third tube. By this means the heat absorbed by the wire netting in the outer tube will be conducted and reflected to the two inner ones, and serve to heat air and gas and increase the intensity of the flame. The products of combustion rise upward within the space inclosed by the glass globe, and then descend along its sides, until they reach the annular space of the regenerator, without impeding the flow of air or gas. Mr. Siemens has constructed the lamp in such a manner that the regenerator, having a disc shape, serves as a reflector at the same time. While the construction of these lamps is not such as to make the system readily applicable to single burner lights, it is destined to enlarge or maintain within certain limits the ground which gas has been rapidly losing in its competition with the electric light for the illumination of large spaces.—*Iron Age.*

Petroleum Destroyed.—During the month of August there has been destroyed by lightning at Parkers, six iron tanks containing about 78,000 bbls. of crude oil. The tank struck was one of the old Empire Line tanks, which had a flat wooden roof covered with sheets of iron, turned over the edge of the roof but not riveted to the shell. At Red Rock, in the Bradford district, about 1,500 bbls. of crude oil was burned during the month caused by the gas at the wells communicating with the fire under the boilers.—*Stowell's Petroleum Reporter.*

THE AMERICAN GAS LIGHT JOURNAL AND CHEMICAL REPERTORY

A. M. CALLENDER & CO.,
PROPRIETORS.

Editor—G. WARREN DRESSER.

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THURSDAY, OCTOBER 16, 1879.

Official Report of Examinations of Gas for two Weeks ending Oct. 11, 1879, made at the Photometrical Room of the Department of Public Works.

Corrected Illuminating Power.

Sept. 1879.	Time of Day at which Test were made.	New York Gas Light Co.	Manhattan Gas-Light Co.	Mutual Gas-Light Co.	Metropolitan Gas-Light Co.	Harlem Gas-Light Co.	Municipal Gas-Light Co.
29	Between 9.30 A.M. and 1 P.M.	15.98	16.90	19.74	16.92	16.11	
30		16.07	16.40	19.87	17.62	16.72	
Oct. 1		16.36	16.65	20.56	16.88	16.21	
2		16.00	16.76	19.09	17.46	16.40	
3		16.45	16.89	19.44	17.43	16.24	
4		16.12	16.61	19.78	16.96	16.64	
	Average	16.16	16.70	19.74	17.21	16.38	
6		16.10	16.87	19.80	17.86	16.78	
7		15.65	16.76	19.23	18.09	17.03	
8		15.42	17.16	19.06	17.20	16.55	
9		16.01	17.24	19.24	16.98	16.64	
10		16.12	16.62	18.80	16.74	16.56	
11		16.00	16.73	19.19	17.11	16.11	
	Average	15.88	16.89	19.22	17.33	16.61	

Sugg-Letheby burner.
E. G. LOVE, Gas Examiner.

A New Carbazol from Coal Tar.—C. Graebe and W. Knecht.—This compound, for which the authors propose no name, is represented by the formula $C_{18}H_{11}N$. It melts at 330°, dissolves scarcely if at all in cold alcohol and benzol, sparingly in boiling benzol and glacial acetic acid. It is moderately soluble in hot aniline. The solution has an intense blue fluorescence.

Engineering Feats.

After ten years' labor, and after an outlay of more than six millions of dollars, the famous Sutro tunnel has been opened, and in eight hours it had lowered the water in the long drowned-out mines more than one hundred feet, and rendered them accessible to work. The great Tehachipichi railway tunnel is near its completion. The great tunnel at Hoosac is in use. Captain Eads has received the indorsement of the United States engineer at New Orleans that he is entitled to half a million dollars for having completed his project of deepening the navigation of the Mississippi by a system of jetties that would keep the river open and insure its commercial standing. There are other equal schemes in progress, all of which are intended to relieve the transportation or assist the industry of the country. Now it is proposed to obviate the difficulties of Isthmian navigation by a railway capable of transporting the largest vessel from sea to sea, while various plans for tunneling or cannaling that impracticable strait are considered.

It would be easy to extend this brief catalogue of some of the great engineering feats of the country within the last few years, not the least among which is that which gives access to New York. But the instances which we have cited suffice. They show the grandeur of the attempts, their practical use, the enormous sums involved, the impediments met and to be met, and the success of American scientific labor. They are very interesting, because they are in the alphabet of a science whose calculus we do not know, and whose European parallels, shown in the Thames tunnel, in the St. Gothard and Mt. Cenci's passes, in the Suez canal, in the projected tunnel between England and France, and in that from Spain to Africa, compel scientific notice everywhere. It is not singular that for so long a period Europe should have held the van in this department. The population there is denser, the commercial wants are much greater, the capital is more enormous, labor is cheaper, and political agree with industrial wants. Here, however, the schemes are scarcely if at all less gigantic, the costs are equal, the uses are not less, and coming advantages connect with present desires. The wonder is that our science ventures upon such essays, and is sustained by such capital; that such a great forecast is indulged in when the moment is unpropitious, and there is such a uniformity of success. The credit is reflected in equal proportions upon the ability which plans and the business which dares to execute.

And these are all engineering feats—feats of that very power which is to-day rendering the Delaware as navigable as the Thames or Mersy, which is boring through eastern as well as western mountains, and separating our peninsulas. Our advantages are being realized and our possibilities attained, so that when the century has closed we shall hold a far different position to the world, relatively and possitively, from that which is now ours.—*North American.*

Iron versus Steel Rails.

A correspondent of the London *Times* writes:

"A reaction has lately been going on in the United States in favor of iron rails, which the iron trade of South Wales has already begun to feel in the shape of some welcome American orders. This partly arises from the fact that, though the life of a steel rail is longer than that of an iron one, the latter can be converted when worn out, and thus commences a new life. But it is doubtful, after all, whether, assuming each kind of rail to be of the very best, there is so much difference in the wearing qualities. An iron rail has lately been exhibited at the American Institute of Mining Engineers which was made in 1870 and has since carried 67,000,000 gross tons of freight, carriages, and engines. With all this immense strain during nine years the rail was only worn at the top of the head for 3-10ths of an inch. Perhaps, after all, the iron age is not so near extinction as has been prophesied."

Another correspondent observes that "It is the opinion of practical men of the highest reputation that, having regard to the marked superiority of the fuel found in Wales and to other advantages of position, a large and profitable trade is still open for a superior quality of bar iron, and one is hardly permitted to doubt that if half the science which has been so successfully applied to the manufacture of steel had been devoted to the manufacture of bar iron, the position of this latter important industry in South Wales would have been widely different from that which it has so unhappily occupied during the past five or six years."

Gas in Wabash, Ind.—Articles of association have been filed with the Secretary of State incorporating the Wabash Gas Co., the capital stock of which is $30,000. The board of directors consist of W. Scott Fritz, E. F. Reid, and Thos. G. Mary, al strangers to our citizens, but men of capital, whose home is, we believe, in Cincinnati. The company has already contracted for ground of R. F. Lutz, having purchased two lots of him just across the canal, opposite king's warehouse. They have received permission from the City Council to run their pipes and mains through the streets, and it is said have contracted with Tom Bridges to have the excavating done at once. Works are also being built at Muncie, and it is expected they will be completed in about two months.—*Wabash Ex.*

Prices of Gas Coal.

Penn and Westmoreland	$4.50	at New York.
" "	3.10	at Baltimore.
" "	3.75	at Philadelphia.
Despard, Newburgh Orrel, Fairmont	4.25	at New York.
	3.50	at Baltimore.
Chesapeake & Ohio	4.50	at New York.
" "		
Newcastle	3.25 to 3.50	
Provincial	3.50 to 3.75	
Cannelton Cannel (by cargo)	8.75	at New York.
Ince Hall	7.25	

The above prices are about $1 per ton below those of 1878.

Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.
(with W B Scott & Co.,)
24 PINE STREET, NEW YORK CITY.
OCTOBER 16, 1879.

☞ All communciations will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

	Capital.	*Par.*	*Bid.*	*Asked.*
Gas Co.'s of N. Y. City.				
Central	466,000	50	60	75
Harlem	1,800,000	50	40	45
" Bonds	170,000			103
Manhattan	4,000,000	50	150	155
Metropolitan	2,500,000	100	117	121
" Scrip	$1,000,000	..	100	103
Mutual	5,000,000	100	55	60
" Bonds, gold	900,000	1000	100	105
Municipal	1,500,000	100	130	135
" Bonds	750,000		105	110
New York	4,000,000	100	90	95
Northern	270,000	50	—	100
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	110	115
Citizens	1,200,000	20	55	60
" S. F. Bonds.	320,000	1000	100	102
Peoples	1,000,000	10	18	25
" Bonds	325,000	...	--	95
" Scrip	300,000	...	75	80
Metropolitan	1,000,000	100	40	50

Nassau.....	1,000,000	25	50	60
" Ctfs.....	700,000	1000	80	85
Williamsburgh	1,000,000	50	75	80
" Scrip		...	90	95
Kings Co.....	200,000	100	—	70
Union Co. E. N. Y...		25	—	50
Richmond Co., S. I.	300,000	...	60	85
Out of Town Gas Companies.				
Bath, Maine.....	70,000	100		
Buffalo Mutual, N.Y	750,000	100	65	70
" Bonds	200,000	1000	95	100
Baltimore, Md.....	2,000,000	100	95	98
" Ctfs., gold	1,000,000		95	10
Bayonne, N. J.....		100		90
Brockport, N. Y.....	25,000	100	...	80
Citizens, Newark.....	918,000	50	100	103
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			132	—
Cincinnati G.& C.Co.				190
Derby of Conn.....	160,000	100	60	80
East Boston, Mass...		25	114	120
Elizabethtown, N. J.	300,000	20	—	130
Fort Wayne, Ind.....		100	...	—
Hannibal, Mo.....	100,000	100	95	100
Hartford, Conn.....	700,000	25	120	125
Hempstead, L. I.....	25,000	100	...	—
Halifax N. S.....	400,000	40	148	150
Hamilton, Ontario...	150,000	40	117½	
Jersey City	750,000	20	145	155
Jamaica, L. I.....	25,000	100	...	—
Jacksonville, Ill.....	120,000	50	100	...
Lewistown Maine...	400,000	100	70	80
Lima, Ohio,.....	60,000	100	—	...
Bonds	30,000		90	
Laclede St Louis Mo.	1,200,000	100	—	75
Long Branch.....		20	30	40
New Haven, Conn...		25	152	—
Peoples, Jersey City		...	40	50
" " Bds.				95
Peoples of Albany...	650,000	100	—	10
" Bonds	350,000	1000	--	-
Peoples of Baltimore		25	44	48
" Bonds....			106	—
Plainfield, N. J.....	80,000	100	—	105
Perth Amboy		25	—	95
Pittsfield, Mass.....			120	130
Rochester, N. Y.....		50	70	80
" Citizens		100	50	60
Rondout & Kingston			75	80
St. Louis Missouri..	600 000	50	72	75
Stillwater, Minn.....	50,000	50	—	26
Saugerties, N. Y	15,000	100	95	100
San Francisco Gas-Co., S. Fr'isco Cal.			95	95¼
Toledo, Ohio..... ...			95	97
Troy, Citizens..	600,000	100	—	60
Washington, D. C...	1,500,000	20	170	185
" Scrip	500,000	20	100	110
Woonsocket, R. I....	150,000	100	80	...
Yonkers.....		50	—	70

The following sales were made at auction—

17 shares Metropolitan, N. Y., at 118; 143 shares capital stock of West Troy Gas Light Company (par value $50), at $10 per share.

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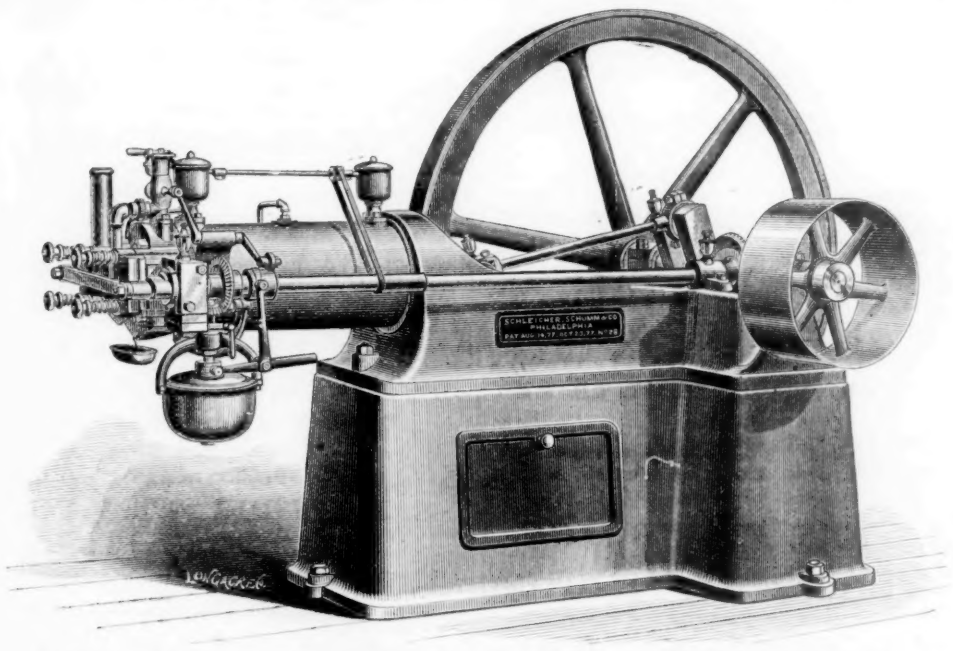

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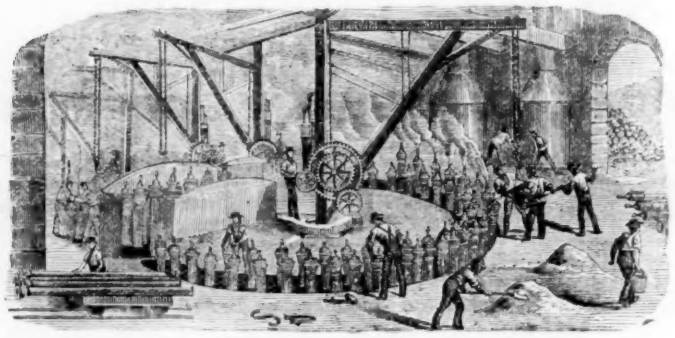

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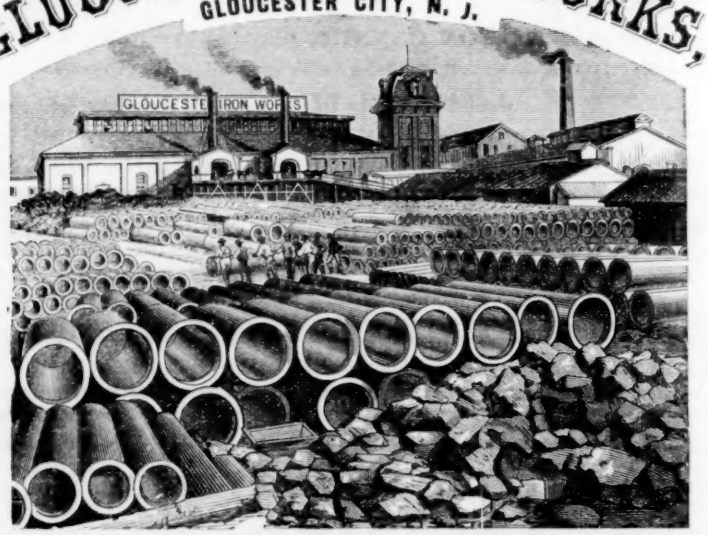

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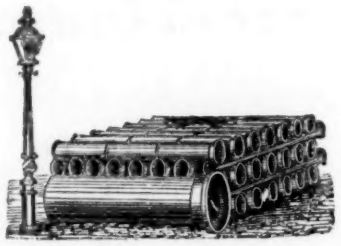

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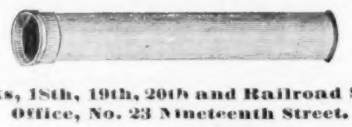

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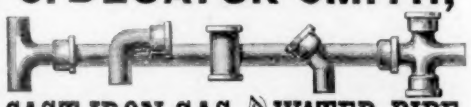

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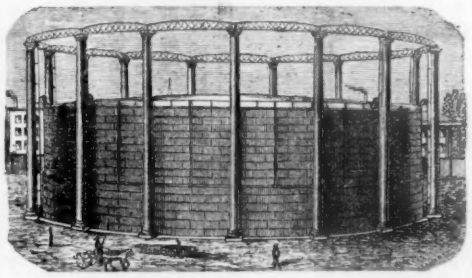

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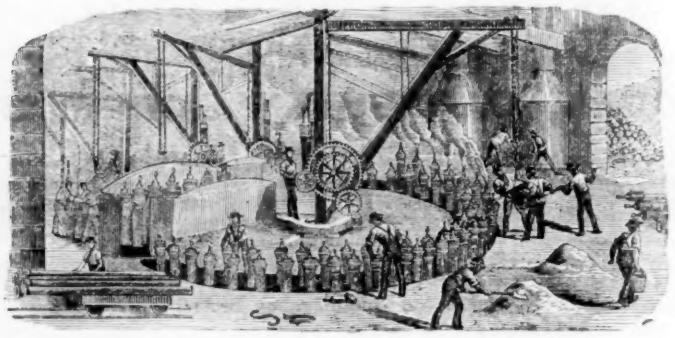

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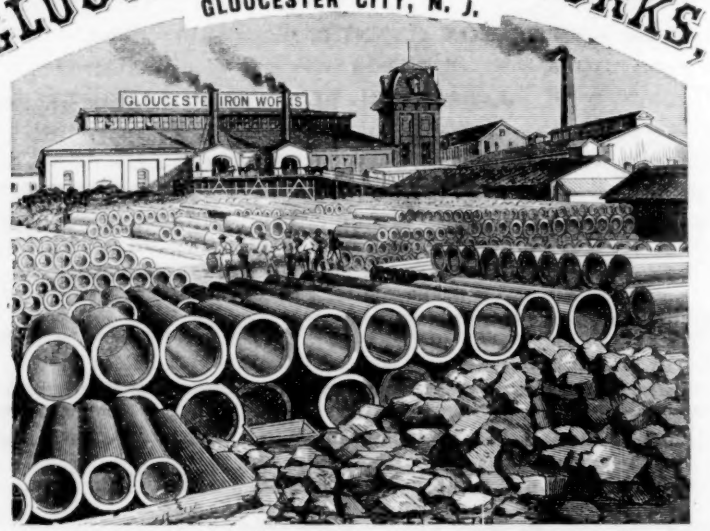

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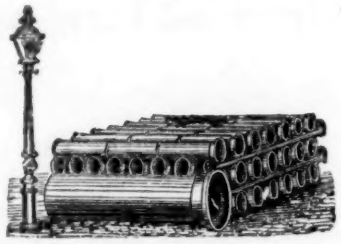

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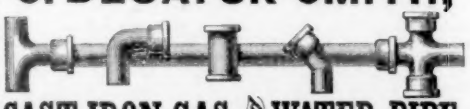

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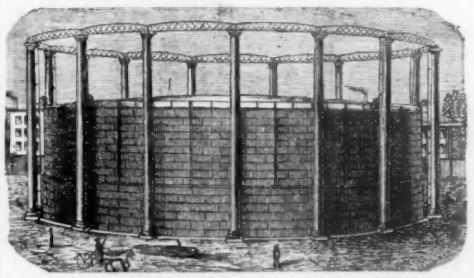

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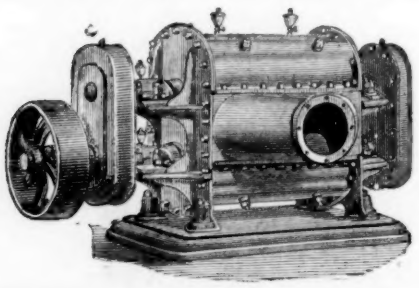

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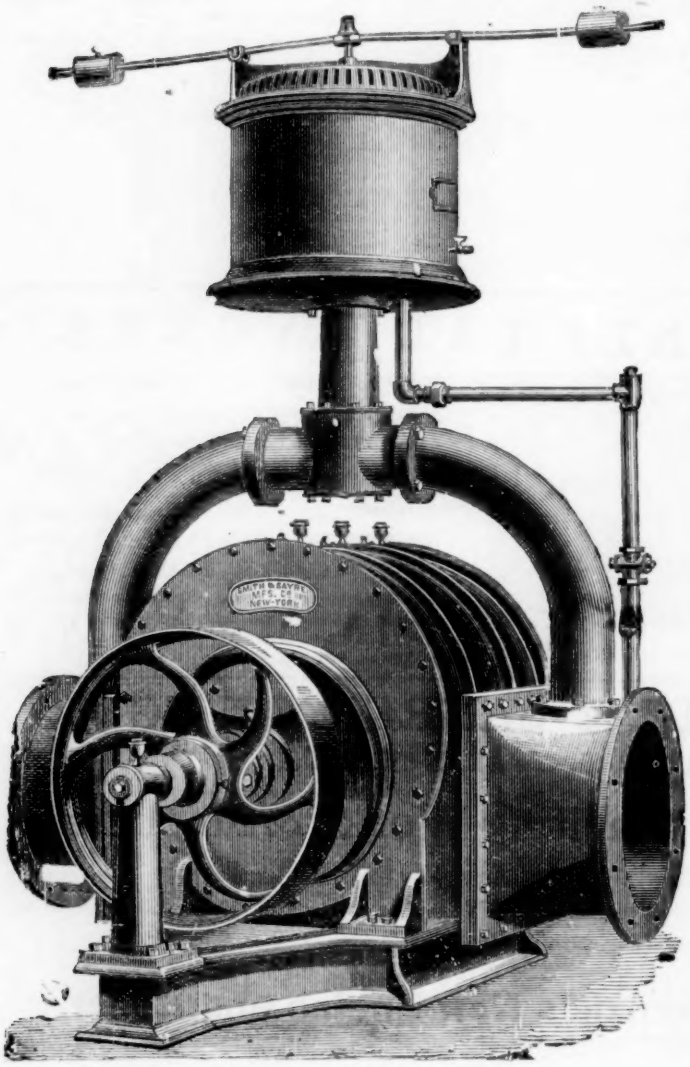

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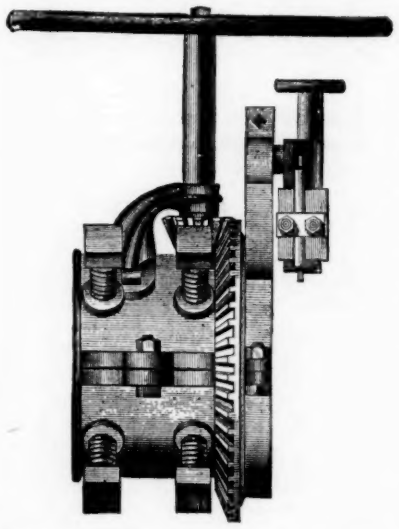

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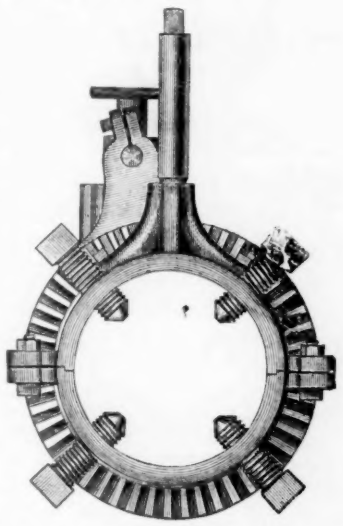

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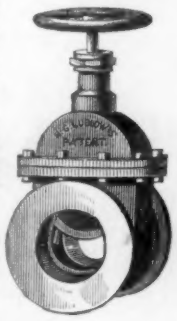

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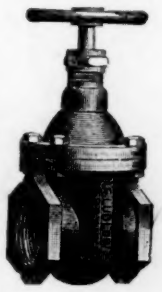

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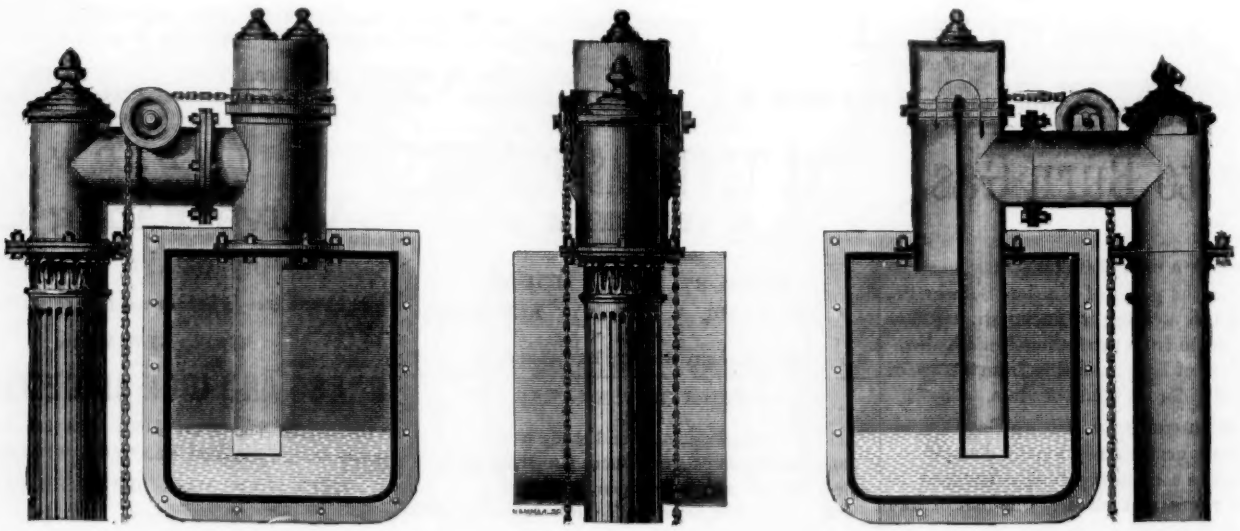

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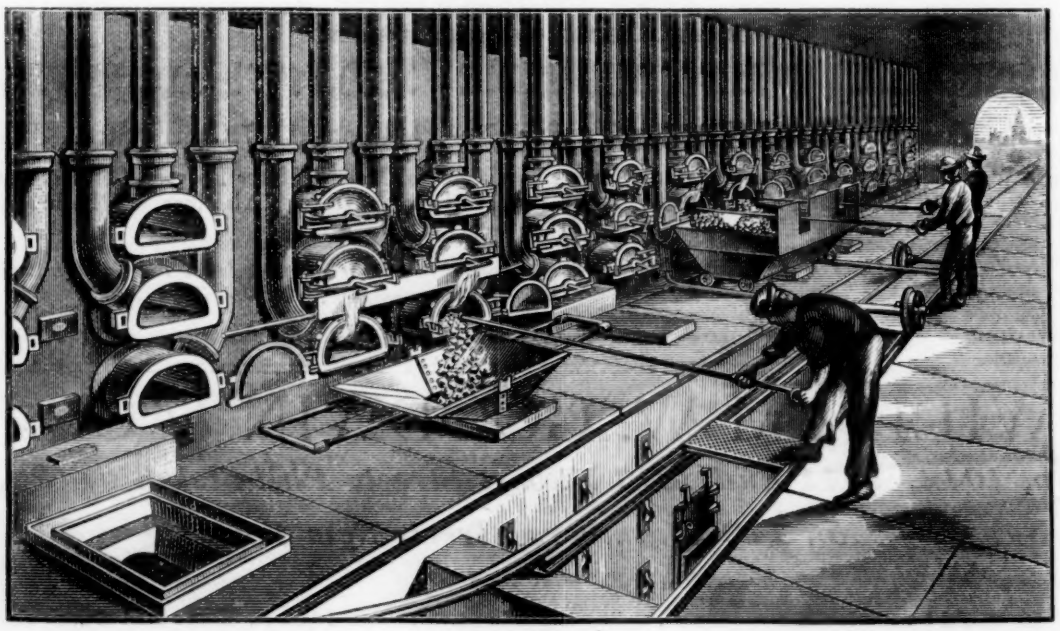

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